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TAPPING EXPERIMENTS AT GUNONG ANGSI.

By F. G. Spring and B. Bunting.

THE experiments to be described were arranged to ascertain the relative yields of rubber from adjacent and opposite quarters, with both daily and alternate-day tapping, and to compare the yields of both systems on a two- and four-year renewal.

The tapping system on adjacent quarters is that of a double V with the cuts 18 inches apart, and that on opposite quarters of two cuts 18 inches apart on each quarter, which give a bark renewal on each system of two and four years for daily and alternate-day tapping, respectively.

A complete set of the four experiments was conducted at the first clearing at an elevation of 300 feet and repeated at the third clearing at an elevation of 1,200 feet. In both clearings the trees are planted on a very steep slope and each area extends to the edge of the surrounding jungle. It should be pointed out that the distance of planting in the first clearing is 25′ × 23′ (measured horizontally) or 76 trees per acre, and in the third clearing 15′ × 15′ or 193 trees per acre, so that the yields of rubber at the two elevations are not strictly comparable, although this factor does not affect the individual experiments at the same elevation.

The trees under experiment were planted in April, 1905, and tapping was commenced at the end of August, 1911, and with the exception of one year top-tapping of the daily plots (to allow of a better renewal of bark) the plots have been tapped on the same system throughout the experiments. The original number of trees in each plot was 80, but unfortunately eight trees were destroyed by wind as shown in the tables.

The experiments were under careful supervision as regards the quantity of bark removed in a given time and each experiment was examined monthly to see that the allowance of $1\frac{1}{2}$ inches of bark per mensem was not exceeded, so that the tapping surface in each experiment was completed almost at the same time.

The labour employed was Tamil, one cooly being in charge of two experiments. Although the tappers were carefully selected it was considered advisable to change them weekly so that, over a period of one month, each cooly tapped every experiment. In this way it was possible to minimise any error which might be produced by the inequality of individual tappers. The gouge knife was used throughout the experiments.

The results of the first and second year's tapping have already been published in the *Agricultural Bulletin* (cf. Vol. I, page 154, and Vol. II, page 119).

The following is a list of experiments in detail. It will be seen that, with the exception of elevation and distance of planting, the experiments were the same at both clearings.

EXPERIMENT 1.

System of tapping—Double V, cuts 18 inches apart.

Every-day tapping. Twenty cuts to the inch.

Time allowed for bark renewal, two years.

First clearing (A)—elevation, 300 feet; distance of planting, 25′ × 23′.

Number of trees, 80; average girth, October 1916, 40.3 inches.

Third clearing (B)—elevation, 1,200 feet; distance of planting, 15′ × 15′.

Number of trees, 80; average girth, October 1916, 34.9 inches.

EXPERIMENT 2.

System of tapping—Double V, cuts 18 inches apart.

Alternate-day tapping. Twenty cuts to the inch.

Time allowed for bark renewal, four years.

First clearing (A)—elevation, 300 feet; distance of planting, 25′ × 23′.

Number of trees, 79; average girth, October 1916, 40.5 inches.

Third clearing (B)—elevation, 1,200 feet; distance of planting, 15′ × 15′.

Number of trees, 78; average girth, October 1916, 33.0 inches.

EXPERIMENT 3.

System of tapping—Opposite quarters, two cuts 18 inches apart on each quarter.

Every-day tapping. Twenty cuts to the inch.

Time allowed for bark renewal, two years.

First clearing (A)—elevation, 300 feet; distance of planting, 25′ × 23′.

Number of trees, 79; average girth, October 1916, 40.9 inches.

Third clearing (B)—elevation, 1,200 feet; distance of planting, 15′ × 15′.

Number of trees, 79; average girth, October 1916, 32.1 inches.

Experiment 4.

System of tapping—Opposite quarters, two cuts 18 inches apart on each quarter.

Alternate-day tapping. Twenty cuts to the inch.

Time allowed for bark renewal, four years.

First clearing (A)—elevation, 300 feet; distance of planting, 25′ × 23′.

Number of trees, 78; average girth, October 1916, 40.2 inches.

Third clearing (B)—elevation, 1,200 feet; distance of planting, 15′ × 15′.

Number of trees, 79; average girth, October 1916, 34.2 inches.

Results of Tapping on Renewed Bark.

It should be stated that these experiments have now been conducted for a period of five years and the records given in the tables refer to the yields of dry rubber on renewed bark.

Adjacent *versus* Opposite Quarters.

As previously pointed out the object of these experiments was to test the relative merits of the two systems of tapping on a two- and four-year renewal, and reference to the tables of yields will show that in every experiment adjacent quarters (double V) gave a higher yield of total rubber than opposite quarters. The comparative yields of each system at both clearings are given below:

Yields of Rubber at First and Third Clearings.

First clearing, 300 feet.			Third clearing, 1,200 feet.			System of tapping.
Plot.	Yield per tree per annum.	Relative yield.	Plot.	Yield per tree per annum.	Relative yield.	
	lbs.			lbs.		
1A	12.9	100	1B	8.8	100	Adjacent quarters, daily
2A	11.0	85	2B	6.7	76	Adjacent quarters, alternate-day
3A	10.7	83	3B	6.6	75	Opposite quarters, daily
4A	9.7	75	4B	6.4	73	Opposite quarters, alternate-day

The total yields of rubber for each system under both alternate and daily tapping in the two sets of experiments are as follows:

	Opposite quarters.		Adjacent quarters.	
	Plots.	Per cent.	Plots.	Per cent.
First clearing ...	3A and 4A ...	100 ...	1A and 2A ...	117.5
Third „ ...	3B and 4B ...	100 ...	1B and 2B ...	118.5

A further comparison of the total yields of the two systems on daily tapping (two years renewal) and also on alternate-day tapping (four-years renewal) is given below:

	Opposite quarters.		Adjacent quarters.	
	Plots.	Per cent.	Plots.	Per cent.
Daily tapping	3A and 3B ...	100 ...	1A and 1B ...	126
Alternate-day tapping ...	4A and 4B ...	100 ...	2A and 2B ...	109.5

From the above figures it will be seen that the excess in yield in favour of adjacent quarters is much less as the interval of bark renewal is increased from two to four years, which points to the fact that opposite quarters is probably a more exhausting system than that of adjacent quarters.

Further opposite quarters, daily tapping (two-years renewal), actually gave a lower yield than adjacent quarters (four-years renewal) in both sets of experiments.

It is interesting to note that in observations made on the starch content of trees tapped under the above systems Bateson * found that there was a much quicker filling up of the renewing bark with starch in trees tapped by the adjacent quarter system, and that on the whole the untapped bark contained more starch than the bark of trees tapped on the opposite quarter system, that is to say, they were better nourished. He also found that the renewed bark was thicker in the trees tapped on adjacent quarters.

Percentage Yields of No. 1 Latex and Scrap Rubber.

Reference to the figures given in the tables will show the percentage yields of No. 1 latex and scrap rubber under the two systems of tapping. It will be seen that in every case adjacent quarters gives a higher percentage yield of No. 1 latex than opposite quarters and a corresponding decrease in scrap rubber. This is due

* Bulletin No. 23, Department of Agriculture, F.M.S.

to the increased production of scrap rubber from opposite quarters caused by tapping two distinct areas and collecting the latex in two cups instead of one.

The following figures show the percentage of No. 1 latex obtained under each system in both sets of experiments :

	Daily tapping.		Alternate-day tapping.	
	Plot.	Per cent.	Plot.	Per cent.
Adjacent quarters ...	1A ...	87.8 ...	2A ...	89.0
Opposite „ ...	3A ...	84.9 ...	4A ...	84.5
Adjacent „ ...	1B ...	87.5 ...	2B ...	86.1
Opposite „ ...	3B ...	81.8 ...	4B ...	83.1

A comparison of Plots 1 and 2 or Plots 3 and 4 in each set of experiment shows that under each system of tapping the percentage of scrap rubber is approximately the same for both alternate and daily tapping, but the area of bark removed is not the same in both cases. Experiments have shown that with equal amounts of bark removed the percentage of scrap rubber is usually higher for alternate-day tapping.

Alternate-Day *versus* Every-Day Tapping.

It must be remembered that these experiments were not arranged to show the respective value of daily and alternate-day tapping, the main object being to see the effect on the systems as the interval of tapping was increased. A comparison of daily with alternate-day tapping would be unfair as the interval allowed for bark renewal is not the same in both cases.

The results of the first year's tapping showed that the yield of dry rubber was in direct proportion to the amount of bark removed, the experiments tapped daily giving double the amount of dry rubber when compared with the same systems tapped on alternate days. The second year's results showed that the differences in favour of daily tapping were much less than the first year's figures, indicating that the trees were showing the effects of over-tapping. The results published in this article confirm this view and especially as the cuts on the alternate-day plots now have the advantage of being nearer the base of the tree, it would seem probable that when the next year's results are available the alternate-day plots will be giving a higher yield than those tapped daily.

General.

Without making any comments on the yields obtained from daily tapping on a two-year renewal, which is not to be recommended in practice, attention must be drawn to the high yields shown by the

alternate-day plots on a four-year renewal, and it will be seen that adjacent quarters (double V) tapped on alternate days gave a yield of 11 lbs. per tree per annum in Plot 2A, and 6.7 lbs. per tree per annum in Plot 2B.

Taking into consideration the distance of planting, the yield of Plot 2B, for a given area, is relatively higher than that of Plot 2A, which is at the lower elevation.

It is obvious that there is some factor, or factors, responsible for the phenomenally high yields which are being obtained, and the following observations may be of interest.

A chemical analysis of the soil in which these plots are planted showed it to be extremely poor, but, on the other hand, a mechanical analysis showed that its physical condition was almost perfect and this may be of much more importance than its chemical composition for the growth of rubber.

The trees at the lower elevation (300 feet) have the advantage of being very widely planted, whilst those at the higher elevation (1,200 feet) are much more closely planted. In both cases the plots are planted on a steep slope with the trees in tiers one above the other, which admits of more light and air than would be possible with the same planting on flat land. This factor probably counteracts in part the ill-effects of the closer planting at the higher elevation.

A careful inspection of the trees at this elevation has shown that the latex continues to flow from newly-tapped cuts for a much longer period than from those at the lower elevation, where the heat arrests the flow by coagulating the latex on the cut. The morning temperature at 1,200 feet is considerably lower than that on the flat and this factor may have a big influence on the yield of latex. It might be mentioned here that Bateson (*loc. cit.*) suggested that the exudation of latex was due to root pressure. The fact that the morning temperature at the higher elevation is below normal would tend to reduce transpiration (the evaporation of water from the leaves) with a resultant increase in the pressure of the tissues in the tree.

It will be seen that the tapping coolies are given a small number of trees to tap, which allows of better tapping than would be possible with a larger task, and this may have some effect on the yield of rubber.

The smallness of the area (10 acres) probably lends itself to a certain amount of protection from the surrounding jungle and it would be interesting to see whether these high yields would be maintained on a larger area of say 50 or 100 acres, tapped under estate conditions.

The question of such high yields is undoubtedly one of great importance and one worthy of further investigation, especially when it is remembered that the yields from the best flat land in the coastal districts will probably never exceed 500 to 600 lbs per acre.

Rainfall Records—Gunong Angsi.

The following is a record of the rainfall taken at an elevation of 1,600 feet:

Month.	Number of wet days.	Rainfall. Inches.
1915.		
July	14 ...	6.99
August	20 ...	8.64
September	18 ...	6.27
October	16 ...	11.83
November	19 ...	11.44
December	13 ...	5.28
1916.		
January	9 ...	2.73
February	4 ...	1.83
March	20 ...	10.11
April	20 ...	15.08
May	15 ...	5.94
June	13 ...	4.32
Total ...	181	90.46

Summary of Results.

1. The yield of rubber from adjacent quarters (double V) is greater than that of opposite quarters. The difference in yield under varying conditions showing an increase of approximately 18 per cent. in favour of adjacent quarters.

2. The percentage of No. 1 latex is shown to be from three to six per cent. higher from adjacent compared with opposite quarters. This is due to the increased yield of scrap rubber obtained from opposite quarters, where the latex flows over double the length of channel and is collected in two cups instead of one, both of which factors tend to produce premature coagulation.

3. That the opposite quarters appear to be a more exhausting system of tapping than adjacent quarters is shown by the ratio of yields for the two systems under daily and alternate-day tapping;

the yield being proportionately higher for alternate-day tapping on opposite quarters compared with daily-tapping on the same system; the severity of the system being less marked as the interval of bark renewal was increased from two to four years. On daily-tapping adjacent quarters gave 26 per cent. more rubber than opposite quarters, whilst on alternate-day tapping the difference in favour of adjacent quarters was only 9.5 per cent.

4. Opposite quarters not only give much poorer total yields and a higher percentage of scrap rubber than adjacent quarters, but has the disadvantage of having two distinct tapping areas, requiring two spouts and cups, which makes the system much more difficult, both as regards tapping and supervision, than one in which the area tapped is restricted to one side of the tree.

5. A number of experiments have been published from time to time showing the superiority of adjacent over opposite quarters on virgin bark, whilst the results in this article obtained from tapping on renewed bark, with trees which have been tapped continuously on the same system, clearly demonstrate the advantage of adjacent compared with opposite quarters as a system of tapping.

Addendum.

Since writing the above article an additional four months' records have been obtained, which show that the yield of rubber is now actually higher from alternate day (four-years renewal) than from daily-tapping (two-years renewal). The following table gives a summary of yields from July to October, the results confirming the views already expressed in this paper:

Yields of Rubber from July to October, 1916 (Inclusive).

Plot.	Trees tapped.	Total yield dry rubber.	Tapping days.	Yield per tree per annum.	Relative yield.	Bark renewal.	System of tapping.
		lbs. ozs.		lbs.		Years.	
1A	79	276 1¼	118	10.5	100	2	Adjacent quarters, daily
2A	79	295 4¾	59	11.2	107	4	„ „ alternate-day
3A	78	196 15	118	7.6	72	2	Opposite quarters, daily
4A	77	252 12¾	59	9.8	93	4	„ „ alternate-day
1B	80	205 0¼	118	7.7	100	2	Adjacent quarters, daily
2B	78	194 12½	59	7.5	98	4	„ „ alternate-day
3B	78	152 13¼	118	5.9	77	2	Opposite quarters, daily
4B	79	167 3	59	6.3	82	4	„ „ alternate-day

Experiment 1A.

Adjacent Quarters, Every-day Tapping, Two Vs 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	85	14	8	12½	94	10½		
August	80	0	8	12	88	12		
September	82	7	8	5	90	12		
October	92	14	9	2½	102	0½		
November	80	8	9	4	89	12		
December	89	4	13	9½	102	13½		
1916.								
January	80	14	16	4½	97	2½		
February	67	0	13	13	80	13		
March	61	14	8	12¾	70	0¾		
April	67	2	9	3	76	5		
May	62	4	10	1¼	72	5¼		
June	58	8	9	10¼	68	2¼		
Totals ...	907	15	125	10½	1,033	9½	80	12.9

Experiment 2A.

Adjacent Quarters, Alternate-day Tapping, Two Vs 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	68	0	5	0½	73	0½		
August	59	3	6	15	66	2		
September	65	15	6	8½	72	7½		
October	81	12	7	5½	89	1½		
November	73	0	8	5	81	5		
December	71	4	9	13½	81	1½		
1916.								
January	84	8	16	5¾	100	13¾		
February	54	0	10	4	64	4		
March	54	8	6	7¾	60	15¾		
April	52	3	7	2	59	5		
May	58	14	5	14½	64	12½		
June	51	0	5	6¼	56	6¼		
Totals ...	774	3	95	8¼	869	11¼	79	11.0

Experiment 3A.

Opposite Quarters, Every-day Tapping, Two Cuts on each Quarter, 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	72	14	8	12	81	10		
August	74	11	8	14	83	9		
September	72	13	9	0½	81	13½		
October	71	11	8	8	80	3		
November	58	15	10	4	69	3		
December	63	8	14	11¼	78	3¼		
1916.								
January	58	8	18	15	77	7		
February	44	12	15	10½	60	6½		
March	49	8	10	2½	59	10½		
April	52	2	8	6¾	60	8¾		
May	49	0	8	3¾	57	3¾		
June	46	0	6	10	52	10		
Totals ...	714	6	128	2¼	842	8¼	79	10.7

Experiment 4A.

Opposite Quarters, Alternate-day Tapping, Two Cuts on each Quarter 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	50	2	6	10½	56	12½		
August	39	5	9	7	48	12		
September	57	8	10	8	68	0		
October	65	14	8	6	74	4		
November	58	3	12	0	70	3		
December	54	10	8	4½	62	14½		
1916.								
January	63	0	14	12	77	12		
February	37	8	9	12½	47	4½		
March	40	4	7	13¾	48	1¾		
April	48	10	10	0¼	58	10¼		
May	56	0	9	12¼	65	12¼		
June	67	8	9	3½	76	11½		
Totals ...	638	8	116	10¼	755	2¼	78	9.7

Experiment 1B.

Adjacent Quarters, Every-day Tapping, Two Vs 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	63	0	5	5	68	5		
August	65	3	7	2	72	5		
September	64	0	6	11	70	11		
October	61	13	7	9½	69	6½		
November	54	11	6	14½	61	9½		
December	51	2	6	12	57	14		
1916.								
January	44	6	10	10¼	55	0¼		
February	38	8	9	2¼	47	10¼		
March	42	8	7	7	49	15		
April	43	8	7	6½	50	14½		
May	43	2	6	6	49	8		
June	43	8	6	2	49	10		
Totals ...	714	6	128	2¼	702	13¼	80	8.8

Experiment 2B.

Adjacent Quarters, Alternate-day Tapping, Two Vs 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	35	12	5	1	40	13		
August	32	0	6	15	38	15		
September	36	10	6	4½	42	14½		
October	41	14	6	9½	48	7½		
November	36	12	6	9¾	43	5¾		
December	33	8	5	14	39	6		
1916.								
January	41	8	6	11¾	48	3¾		
February	30	0	6	3	36	3		
March	36	12	5	10	42	6		
April	42	8	6	2¼	48	10¼		
May	44	2	5	10½	49	12½		
June	38	4	5	6	43	10		
Totals ...	449	10	73	1¼	522	11¼	78	6.7

Experiment 3B.

Opposite Quarters, Every-day Tapping, Two Cuts on each Quarter, 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	39	7	6	9	46	0		
August	43	11	8	1	51	12		
September	46	8	8	2	54	10		
October	45	1	7	15¾	53	0¾		
November	42	2	6	7¾	48	9¾		
December	34	2	9	10	43	12		
1916.								
January	31	0	11	4½	42	4½		
February	25	8	10	4	35	12		
March	28	8	7	14½	36	6½		
April	27	12	8	8½	36	4½		
May	30	12	5	3¾	35	15¾		
June	30	4	4	12	35	0		
Totals ...	424	11	94	12½	519	7½	79	6.6

Experiment 4B.

Opposite Quarters, Alternate-day Tapping, Two Cuts on each Quarter, 18 inches apart.

Month.	No. 1 latex.		Scrap.		Total rubber.		No. of trees tapped.	Yield per tree per annum.
1915.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.		lbs.
July	42	11	3	11	46	6		
August	36	4	9	8	45	12		
September	32	7	8	1	40	8		
October	41	1	10	14	51	15		
November	35	9	10	7¼	46	0¼		
December	30	5	8	4	38	9		
1916.								
January	38	0	7	9½	45	9½		
February	26	8	7	10½	34	2½		
March	29	0	6	3½	35	3½		
April	35	14	6	3¾	42	1¾		
May	39	10	4	3¾	43	13¾		
June	37	8	3	10	41	2		
Totals ...	424	13	86	6	511	3	79	6.4

Relative Yields of No. 1 Latex and Scrap Rubber.

Plot.	No. 1 latex.		Scrap.		Total rubber.		Percentage No. 1 latex.	Percentage scrap.	System of tapping.
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	%	%	
1A	907	15	125	10½	1033	9½	87.8	12.0	Adjacent quarters, daily
2A	774	3	95	8¼	869	11¼	89.0	11.0	„ „ alternate-day
3A	714	6	128	2¼	842	8¼	84.9	15.1	Opposite quarters, daily
4A	638	8	116	10¼	755	2¼	84.5	15.5	„ „ alternate-day
1B	615	5	87	8¼	702	13¼	87.5	12.5	Adjacent quarters, daily
2B	449	10	73	1½	522	11¼	86.1	13.9	„ „ alternate-day
3B	424	11	94	12½	519	7½	81.8	18.2	Opposite quarters, daily
4B	424	13	86	6	511	3	83.0	17.0	„ „ alternate-day

Abstract of Yields and Experimental Data.

Plot.	Trees tapped.	Average girth Oct., 1916.	Total yield dry rubber.		Tapping days.	Yield per tree per annum.	Relative yield.	Barks renewal.	System of tapping.
		Ins.	lbs.	ozs.		lbs.		Yrs.	
1A	80	40.3	1,033	9½	355	12.9	100	2	Adjacent quarters, daily
2A	79	40.5	869	11¼	176	11.0	85	4	„ „ alternate-day
3A	79	40.9	842	8¼	355	10.7	83	2	Opposite quarters, daily
4A	78	40.2	755	2¼	176	9.7	75	4	„ „ alternate-day
1B	80	34.9	702	13¼	355	8.8	100	2	Adjacent quarters, daily
2B	78	33.0	522	11¼	176	6.7	76	4	„ „ alternate-day
3B	79	32.1	519	7½	355	6.6	75	2	Opposite quarters, daily
4B	79	34.2	511	3	176	6.4	73	4	„ „ alternate-day

NOTES ON THE PREPARATION, BY THE DISTILLATION AND BY THE COMBUSTION OF WOOD, OF ACID COAGULANTS, AND ON THEIR EFFECT ON THE QUALITY OF RUBBER.

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THE great advance in price which imported acetic acid experienced gave special interest to the local preparation and employment of a crude acetic acid coagulant from wood.

It seems to have been generally assumed that, since the coagulating power of wood smoke or of the product of the dry distillation of wood was due, substantially, to acetic acid, the employment of a coagulant prepared by the combustion or distillation of wood could not be other than unexceptional from the point of view of quality. It was also widely assumed that the facts, that wood smoke was used in the preparation of Fine Hard Para rubber and is also often held to improve the quality of plantation sheet rubber, supported this view. The present authors could not, however, accept this assumption. We have, independently, in earlier publications[1], shown reasons for believing that, however convenient the use of smoke may be for the prevention of mould, its general effect on vulcanizing quality is not beneficial, but tends, rather, to be prejudicial.

Although the agents obtained from wood depend for their coagulating power substantially on the acetic acid which they contain, yet the other substances which they also contain could not be assumed to be without effect on quality. One of us had shown[2] that phenolic substances, such as those present in wood products, have a marked prejudicial effect on quality, when added in small quantities to latex. We felt, therefore, that however cheaply coagulating agents could be produced locally from wood, the effect on quality of such agents ought to be investigated before their use was approved.

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[1] Eaton and Grantham, *Journ., Soc. Chem. Ind.*, No. 19, Vol. XXXIV (1915).

[1] Whitby, *Journ., Soc. Chem. Ind.*, No. 9, Vol. XXXV (1916).

[2] Whitby, *loc. cit.*

During the preparation of the samples required for the investigation, information as to the probable cost of production of crude acetic acid coagulants from wood was obtained and is given in the notes below.

Preparation of Samples of Pyroligneous Acid.

Wood was dry distilled from a cylindrical iron retort, closed by a valve-like lid held down by a screw, and connected with a water-cooled worm condenser. In the experiments two kinds of wood were employed for charging the retorts—namely, rubber wood and mangrove.

The heating of the retort was done by wood. The acid-content of the bulked distillate varied in the different trials roughly from 5-7½ per cent., expressed in terms of acetic acid. This variation was, of course, expected. It was found that the concentration of the distillate increased as the distillation proceeded. Thus, for example, in a distillation of mangrove timber conducted for two hours the following figures were found:

	Acetic acid.
Distillate collected during first half hour ...	6.0 per cent.
„ „ last „ ...	13.2 „

The degree of dryness of the wood used, the temperature at which distillation is conducted, whether the distillation is continued until nothing further will come over or is stopped part-way:—all these factors influence the degree of concentration of the distillate. Doubtless the nature of the wood employed is also of influence; but, within the limited range of our observations, it did not appear to be of overwhelming importance. As rough average figures for yield the following were found:

> Assuming acetic acid to be used for coagulation at the rate of 6 per cent. of the (dry) weight of rubber, a charge of 1 pikul of wood yields acid sufficient to coagulate 700 lbs. of rubber—that is, the distillate from 1 ton of wood coagulates 12,000 lbs. rubber.

Regarding cost.—We cannot give hard and fast figures, but make the following notes:

In these experiments, the fuel used for heating the retort was a more serious item than the wood used for charging it.

In actual practice on a large scale, however, it would doubtless be found that, by a suitable arrangement of furnaces and by the utilization of the gases issuing from the retort, the amount of fuel required would be much less. Or it might be found preferable to employ coal as fuel.

Charcoal (to the extent, roughly, of 25-30 per cent. of the weight of wood taken) is left behind in the retort. This could be used for running a suction gas plant, but, relatively to the amount of rubber which could be coagulated by the distillate, is small in amount, and would provide only a fraction (say 1/10th) of the fuel necessary to drive the machinery required for the rubber crop which the distillate could coagulate.

As most of the acid comes over during the earlier part of the distillation, it might prove more economical in practice to discontinue the distillation after it had gone on for a certain period.

Preparation of a Coagulant ("Smoke Solution") by Passing Smoke Through Water.

It was not improbable that a coagulant could be made more cheaply than could pyroligneous acid by the simple expedient of dissolving out the water-soluble constituents of smoke.

We have made experiments on the preparation, by this expedient, of an acid coagulant from wood, and on the influence on quality of such a coagulant, and have found that, although the method appears to be cheaper than distillation, the coagulant produced by it has a definitely prejudicial effect on quality.

The apparatus employed consisted of a furnace with small air inlets at the bottom and a smoke outlet pipe at the top. The smoke delivery pipe passed into water contained in a vessel attached to an exhaust pump. By running the pump, the combustion of the charge of wood in the furnace could be maintained and the smoke drawn through the water. The apparatus was run, so that the wood did not break into flame but was kept in slow combustion. The water through which the smoke was drawn was kept cool, by an outside vessel of water, so as to secure the most complete extraction of the soluble constituents of the smoke. The wood burnt in the furnace was rubber wood.

As the passage of the smoke continued, the water assumed a brown colour and its acidity gradually increased. The strength of the solution finally obtained varied, of course, with circumstances (usually from about 1.5—2.5 per cent.) but it was found, roughly, that using 1 gallon of water per 15 lbs. of wood burnt, a solution of acidity equal to 2 per cent. acetic acid was obtained in $1\frac{1}{2}$ hours.

The product contained a good deal of tar, but, by filtration, it gave a clear, bright, brown liquid.

Regarding cost.—To yield a given amount of acid the charge required appear to be rather more than twice that necessary to yield the same amount of acid by distillation, but beyond the charge itself no further wood or other fuel is required.

Preparation of the Samples.

All the samples in any one set were made from the same batch of latex. Latex was collected in an undiluted condition and was always diluted for the preparation of slab to a rubber-content of approximately 15 per cent. and for the preparation of sheet or crêpe to a rubber-content of approximately 12.5 per cent. Acetic acid was used in the proportion of 0.625 per cent. of the rubber content. The coagulants from wood were used in the same proportion. (It had been found that the coagulating power of these was substantially proportional to their degree of acidity.) The coagulant was always appropriately diluted, so as to make the final concentration of the latex the same. Sodium bisulphite was added to the latex used for crêpe preparation and was employed in the proportion of 0.8 per cent. of the rubber-content. The latex was in all cases allowed to stand over-night before rolling or crepeing. Rolling and crepeing procedure was kept constant. The slabs were allowed to stand 12 days before being crêped.

Regarding the appearance of the rubber.—It was found that the wood coagulants produced considerable oxidation and yielded smoked sheet and slab considerably darker than that produced by acetic acid. In the case of crêpe the sodium bisulphite present prevented oxidation, and the product was perfectly pale.

It was noted that the wood coagulants exercised, by virtue of their antiseptic character, a certain influence in preventing the occurence of bubbles in smoked sheet. It was also noted that they seemed to have a distinctly accelerating effect on the rate of drying of smoked sheet.

Vulcanization Tests.

The vulcanization tests were conducted on the lines described by one of us in former communications.[1] In regard to any one set of samples there are obtained stress-strain curves for the vulcanized products yielded by each sample under a series of vulcanization periods, increasing by intervals of a quarter of an hour. These curves are drawn out so as to bring together sets of curves showing (*a*) all the samples under the same vulcanization period, (*b*) the same sample under the different vulcanization periods. These sets of curves—and in particular the former—display quite unambiguously the relative rates of cure of the samples. Particularly where, as in regard to the samples dealt with in this paper, marked differences between the tensile figures at break are not to be observed between samples under comparison, we place almost exclusive emphasis on the relative positions of the tensile curves.[2]

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[1] *See* Eaton and Grantham, *loc. cit.*

[2] Consideration of the curves in regard to their "type" is not attempted here; but it may be pointed out that if, as earlier results would indicate, samples containing phenols have a poorer "type" than samples not containing phenols, the conclusions arrived at in the present communication would be made only more evident.

Influence of Pyroligneous Acid on Quality.

The indication of our vulcanization tests is that, in general, pyroligneous acid tends to retard the vulcanization somewhat. The extent of its effect was not constant. It appeared that some samples of the acid had a more marked effect than others, and that with some batches of latex the effect was much less considerable than with others. The effect of acid distilled from mangrove was more marked than that of acid distilled from rubber wood. The former acid had a considerably greater effect in bringing about oxidation of the coagulum than the latter.

The effect on sheet was more marked than the effect on slab. On crêpe (which, of course, represents rubber which has been well masticated and washed) the effect appeared to be inappreciable.

We quote results for two sets of samples.

I.—Pyroligneous Acid from Rubber Wood.

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. mm.) (*a*)	Elongation at break (original length, 100). (*b*)	Product. (*a* & *b*)
	Hours.	Hours.			
Slabs—					
No. 222, A. By acetic acid	1½	1½	1.32	1,005	1,326
„ B. By filtered pyroligneous acid ...	1½	1½	1.38	994	1,371
No. 222, C. By unfiltered pyroligneous acid, containing tar	1½	1½	1.37	991	1,357
Smoked sheets—					
No. 222, P. By acetic acid	2½	2½	1.34	973	1,303
„ N. By filtered pyroligneous acid ...	2½	2¾	1.44	973	1,401
No. 222, M. By unfiltered pyroligneous acid, containing tar	2½	2¾	1.45	972	1,409
Crêpes—					
No. 222, E. By acetic acid	3	3	1.21	992	1,200
„ D. By filtered pyroligneous acid ...	3	3	1.34	1,006	1,348

An examination of the curves made it clear that the effect of the pyroligneous acid had been to retard the rate of cure about 15 minutes in the case of smoked sheet and five minutes in the case of slab. In the case of crêpe there had been absolutely no effect on the rate of cure: the curves for samples D and E were coincident.

The inclusion of the tar originally present in the pyroligneous acid appeared to be without influence on quality. Incidentally the results agree with former conclusions regarding the relative rates of cure of rubber prepared in the three forms, slab, sheet and crêpe.

II.—Pyroligneous Acid from Mangrove.

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. m.m.) (*a*)	Elongation at break (original length 100). (*b*)	Product. (*a* & *b*)
	Hours.	Hours.			
Slabs—					
No. 222, H. By acetic acid	1½	1½	1.40	994	1,391
„ J. By filtered pyroligneous acid ...	1½-1¾	1¾	1.40	960	1,344
Smoked sheets—					
No. 222, K. By acetic acid	2¼	2½	1.41	967	1,363
„ L. By filtered pyroligneous acid ...	2½	2¾	1.25	962	1,202

Although it cannot be seen from the above figures, it was evident from a consideration of the whole series of breaking figures obtained for the samples and particularly from the curves that the effect of the pyroligneous acid on the rate of cure was greater in the case of smoked sheet than in the case of slab, the former being about 20 minutes and the latter only 10 minutes behind the corresponding acetic acid sample.

Effect of "smoke solution" on quality.—In all the samples examined the use of the coagulant obtained by the passage of smoke through water for the preparation of smoked sheet clearly had a prejudicial effect on quality. We concluded that "smoke solution"

has a clearly marked effect in retarding the rate of cure. The following are the vulcanization results for one set of samples:

III.—"Smoke Solution."

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. mm.) (*a*)	Elongation at break (original length 100). (*b*)	Product. (*a* & *b*)
Smoked sheets—	Hours.	Hours.			
No. 258, A. By acetic acid	2-2¼	2½	1.22	948	1,156
„ B. By "smoke solution" sample 1 (containing 1.65 per cent. acid)	2½-2¾	3	1.23	972	1,185
No. 258, C. By "smoke solution" sample 2 (containing 2.5 per cent. acid)	2½-2¾	2¾	1.19	963	1,145

The curves showed B and C to have similar rates of cure and to be definitely slower (to the extent, respectively, of about 25 and 20 minutes) than A.

The prejudicial effect of "smoke solution" appears to be greater than that of pyroligneous acid. The following set of samples shows this:

IV.—"Smoke Solution."

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. mm.) (*a*)	Elongation at break (original length 100). (*b*)	Product. (*a* & *b*)
Smoked sheets—	Hours.	Hours.			
No. 258, D. By acetic acid	2-2¼	2¼	1.19	983	1,169
„ E. By pyroligneous acid	2-2¼	2¼	1.22	986	1,202
No. 258, G. By "smoke solution" sample 3 (containing 1.1 per cent. acid)	2¼	2¼	1.03	1,000	1,030

The curves made it quite clear that the rate of cure of G was ¼ hour behind the other samples. The curves for the other samples were practically coincident.[1]

The sample of pyroligneous acid employed in the preparation of this set of samples was the same as that used for No. 222, N, quoted earlier. In the case of this set of samples the pyroligneous acid was without appreciable effect; yet the "smoke solution" clearly retarded the cure.

Effect of Phenols on the Quality of Slab and Sheet.

It was known, as mentioned earlier, that the addition to latex of phenols reduces the rate of cure of smoked sheet. It is found in the present investigation that pyroligneous acid has in general a similar effect, and that its effect is more marked in the case of an acid, distilled from mangrove, containing a larger amount of phenolic bodies (indicated by the greater effect in producing oxidation of the coagulum) than in the case of an acid, distilled from rubber wood, containing a smaller amount of phenolic bodies. It is found, however, that the effect of pyroligneous acid on the rate of cure of slab rubber is smaller than on that of smoked sheet. In view of these facts the effect of the addition to latex of phenols on the rate of cure of comparable samples of slab and smoked sheet was investigated. The results show that although phenols retard the cure of smoked sheet, they may have no effect on the rate of cure of slab.

Preparation of samples: Phenol ("carbolic acid") or cresol (cresylic acid B.P.) was added in aqueous solution, to latex in the proportion of 0.4 per cent. of the rubber-content. Coagulation was brought about by acetic acid, the proportion of coagulant used and the strength of the latex being the same as for the earlier samples. The latex to which the phenolic bodies had been added oxidised rapidly, showing, in fact, signs of discolouration within 10 minutes of the addition of acid. The coagula containing cresol were a deep reddish-brown on the surface next morning, while those containing phenol were slate-grey. The corresponding controls were almost white.

In the case of slab it was observed that the growth of moulds on the surface was delayed somewhat by the presence of the phenols. In order to allow of the decomposition in slab completing itself, the slabs were left for one month before being creped.

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[1] Eaton and Grantham, *Journ., Soc. Chem. Ind.*, No. 13, Vol. XXXV (1916).

Vulcanization results: We quote two sets of samples, in one of which phenol was used and in the other cresol.

V.—Slabs and Sheets with Phenol.

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. mm.) (*a*)	Elongation at break (original length 100). (*b*)	Product. (*a* & *b*)
Slab—					
No. 281, C. Without phenol...	1 hour	1 hour	1.32	1,011	1,334
No. 281, D. With phenol	1 „	1 „	1.29	1,008	1,300
Smoked sheets—					
No. 281, A. Without phenol...	2 hours	2¼ hours	1.39	966	1,342
No. 281, B. With phenol	2¼ „	2⅓ „	1.38	981	1,353

It was clear from the curves that C and D were practically identical in rate of cure—the curves were practically coincident, and that B was slower than A, to the extent of about ⅔ of an hour.

VI.—Slabs and Sheets with Cresol.

Sample.	Time of cure giving standard curve.	Time of cure giving maximum product.	Breaking load (kilos per sq. mm.) (*a*)	Elongation at break (original length 100). (*b*)	Product. (*a* & *b*)
Slab—					
No. 281, E. Without cresol	1¼-1½ hrs.	1⅓ hours	1.32	977	1,289
No. 281, F. With cresol	1¼-1½ „	1½ „	1.34	950	1,273
„ J. With excess 1 per cent. cresol ...	1¼-1½ „	1½ „	1.39	975	1,355
Smoked sheets—					
No. 281, G. Without cresol	2¾-3 „	3 „	1.29	974	1,256
No. 281, H. With cresol	3 „	3¼ „	1.24	963	1,194

The curves for E, F and J were very close together, and it was clear that the samples were substantially similar.

In the case of G and H the curves made it quite clear that H was, approximately, ¼ hour slower than G.

It may be suggested that the difference in action of small amounts of phenols on slab and on sheet is due, on the one hand, to their not seriously interfering, over a month, with the change (decomposition) to which slab owes its rapidity of cure, and, on the other hand, to their retarding that change in sheet which may be surmised to influence its rate of cure and to take place only during the comparatively short period of time before the moisture-content becomes low.

It may be noticed that it has been shown[1] in other experiments that the presence of another antiseptic—viz., formalin, had a great effect on the rate of cure; but in these experiments a very large quantity of formalin (ca. 12 per cent. of the rubber weight), which would be expected to stop all decomposition, was used.

General Considerations.

The increased oxidation of the coagulum which pyroligneous acid produces doubtless depends on the phenolic bodies present. (An aqueous extract of wood cresote has a similar effect in producing oxidation.) And it would appear that the effect of pyroligneous acid on quality is also determined in considerable part by such bodies. In agreement with this is the fact, recorded above, that, as with phenol and cresol, the extent to which pyroligneous acid affects the rate of cure, is greater on smoked sheet than in slab, and, further in agreement, is the fact that a pyroligneous acid sample judged to contain a greater amount of phenolic bodies had a greater effect than a sample judged to contain less.

The question presents itself as to why a coagulant produced by the passage of smoke through water should have a more marked influence on the rate of cure than pyroligneous acid. It may be suggested that the difference lies in the fact that in the preparation of "smoke solution" certain products of the combustion of wood are retained which in the distillation of wood are not formed to the same extent or escape as gas. It may reasonably be surmised that the chief product which is thus present in greater amount in "smoke solution" than in pyroligneous acid is formaldehyde. (All the samples of "smoke acid" and of pyroligneous acid prepared were tested and found to contain aldehyde. Quantitative determinations, however, were not made.)

The prejudicial effect on the rate of cure shown by coagulants obtained by distilling wood or by dissolving the water-soluble constituents from smoke clearly bears on the use of smoke in raw rubber preparation—a matter that, under different forms, frequently presents itself. When wet sheet is placed in smoke, as in the ordinary preparation of smoked sheet, it must dissolve from the smoke a greater or less amount of the soluble products of the

[1] Eaton and Grantham, *ibid.*

combustion and distillation of wood, and this must have a retarding influence on the rate of cure. In point of fact, as mentioned earlier, former experiments had led us, independently, to the conclusion that, contrary to the widely-held view, smoking of sheet does not improve, but tends, rather, to prejudice, quality, at all events so far as rate of cure is concerned.

Similarly, when coagulation is performed by smoke, as in the case of Fine Hard Para, it is probable that smoke constituents which become incorporated with the rubber exercise a retarding influence on the rate of cure. Were decomposition to be allowed to go on in a mass of rubber such as that forming a ball of Fine Hard Para, it would be expected that, like slab, the rubber would vulcanize rapidly. The smoke constituents present (assisted, possibly, by the heat to which the latex was subjected), however, prevent this decomposition. But, even so, it might have been expected[1] that the presence in Fine Hard Para of a much greater quantity of the serum solids than in smoked sheet, would be sufficient to produce a greater rapidity of cure than is found in smoked sheet. It has been shown, however,[2] that the preparation of rubber by smoke coagulation in the manner of Fine Hard Para does not give any greater rapidity of cure than its preparation as smoked sheet. It seems fairly clear, then, that the smoke employed in the preparation of Fine Hard Para, although, doubtless, of value, from the ordinary point of view, as a preservative, has a bad effect on the rate of cure.

Note.—In connection with the distillation of wood, one of us has since found, that, by using a suitable retort constructed in brickwork and utilizing the waste gases and economising the heat, the fuel used for a distillation lasting 10 hours is only $1\frac{1}{4}$ to $1\frac{1}{2}$ times the weight of the charge distilled. By the use of coal as fuel even a greater economy can be effected.

Also the rapidity of distillation has a very great influence both on the quantity and strength of the distillate, slow distillation being preferable and, within the periods employed, requiring only slightly more fuel than for a more rapid distillation. This confirms previous experience. The experiments referred to here are being carried out on behalf of the Government and full details will be published later.

It might be added that the condenser used in the unpublished experiments, now referred to, is a vertical four tube condenser only two feet long and is efficient for the retort holding over 300 lbs. of mangrove wood, the main pipe between retort and condenser being only $5\frac{3}{4}$ feet long. Needless to say, crude open retorts are very wasteful in fuel.

Any planter or others interested can see the experimental installation at the Agricultural Department at any time by appointment.

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[1] Whitby, "A comparison of the Brazilian and Plantation methods of preparing Para rubber," *Journ., Soc. Chem. Ind.*, No. 9, Vol. XXXV (1916).

[2] Whitby, *loc. cit.*

UTILITY OF LALANG AS A ROOFING MATERIAL.

By F. G. Spring.

IT is surprising that lalang grass (*Imperata arundicacea*) which is so common throughout Malaya is not more generally made use of in this country. The Chinese, notably market gardeners, utilize it to some extent for roofing purposes and is fairly commonly seen on dwelling houses in the kampongs and smaller villages.

The District Officer, Upper Perak, in a letter to the Director of Agriculture, suggests that a trial be given to lalang thatch for temporary buildings in place of attaps as it has a great vogue in India, where it is found to be cooler in hot and warmer in the rainy season than attaps and the chance of fire, he remarks, is no greater.

As regards durability of lalang there is considerable variation depending on the thickness of thatch, 3-inch, 5-inch and 8-inch roofs are said to last about two years, three years and five to six years, respectively, while the life of a good attap roof might be placed at about three years. It is evident that the thicker the thatch the cooler is the atmosphere underneath during the hot season.

How it compares with attap in this country as regards temperature I am unable to say, but a number of Chinese residents claim that a room with a good 8-inch lalang thatch is cooler than attap.

A method of lalang thatching adopted by the Chinese in this country is as follows: Specially long grass is selected and cut, leaving as short a stubble as possible, after which it is sun-dried for about four days. A frame work is constructed, usually of split bamboo, beaten out flat, and lalang placed on either side of this frame work until the desired thickness is attained, when the whole is fixed to the rafters or main supports by wire, or rotan, the former being generally preferred. A lalang roof is built with a bigger slope than that on which attap is used, the object being to drain off the rain water as rapidly as possible.

The cost in using this grass rises as the thickness of thatch increases, an 8-inch lalang roof costing about the same as attap but a 4- to 6-inch, which is perhaps the average, would work out somewhat cheaper. In out districts, where attaps are expensive and difficult to obtain, lalang might be used to advantage in many cases.

POTASH IN BANANA STALKS AND SKINS.

TWO interesting notes by R. H. Ellis on the presence of potash in banana refuse are contained in the *Journal of the Society of Chemical Industry*, Vol. XXXV, No. 8, April 29, 1916 and Vol. XXXV, No. 9, May 15, 1916. An abstract of these results may prove of interest to those who may have quantities of such refuse, which is evidently of some value for manurial purposes.

The following table gives an analysis of the ash of banana stalk:

	Per cent.
Silica (SiO_2)	9.61
Iron oxide (Fe_2O_3)	0.16
Alumina (Al_2O_3)	3.49
Lime (Ca O)	1.69
Magnesia (Mg O)	1.68
Potash (K_2O)	45.90
Soda (Na_2O)	trace
Sulphuric acid (SO_3)	2.10
Carbonic acid (CO_2)	31.11
Chlorine (Cl)	1.52
Phosphoric acid (P_2O_5)	2.74
	100.00

The above figures were also confirmed by Dr. A. J. Hanley of the Agricultural Department, Leeds University. The following table shows the results obtained by both analyses:

	Ellis. Per cent.	Hanley. Per cent.
Moisture in original stalk	91. 6 ...	92. 7
Dried matter in „ „	8. 4 ...	7. 3
Ash in „ „	2. 4 ...	1. 5
Potash in „ „	1.14 ...	0. 9
Ash in dried matter ...	29. 9 ...	20. 5
Potash in „ „	13.73 ...	12.35
Potash in ash	45. 9 ...	59. 1

The juice extracted by pressure in a small meat press was found to contain 0.7 per cent. of potash.

One ton of stalk on the above basis will yield 188 lbs. of dried matter containing 13.7 per cent. of potash, or 54 lbs. of ash containing 47.5 per cent. of potash, equivalent to 25 lbs. of pure potash.

As will be seen, about half the total mineral ash consists of potash, chiefly in the form of carbonate.

Analysis of Banana Skins.

Further analyses by Ellis of the fruit skins showed these to be also rich in potash. The results are given in the following table:

	Per cent.
Moisture in banana skins	88. 2
Dried matter in „ „	11. 8
Ash in banana skins	1.77
Potash in „ „	1.05
Ash in dried matter	15.00
Potash in „ „	9.03
Potash in ash	57.16

It was stated that 9,000,000 bunches of bananas are imported annually into Great Britain, each stalk containing an average of 180 bananas, the skin of which weigh 15 lbs. or a total of 60,271 tons containing 11.8 per cent. or dried matter—*i.e.*, 7,112 tons of dried matter containing 9 per cent. of potash equivalent to about 646 tons of potash. Also 9,000,000 stalks, weighing when stripped, 4 lbs. or a total of 16,071 tons, equivalent to 1,350 tons of dried matter containing 13.7 per cent. of potash, which corresponds to, approximately, 193 tons.

B. J. EATON.

THE DETERMINATION OF THE ACIDITY OF SOILS AND ITS VALUE IN DETERMINING THE QUANTITY OF LIME TO BE APPLIED IN PRACTICE.

By J. Grantham.

IN the *Agricultural Bulletin* for November, 1914,[1] Barrowcliff described a method for determining the acidity of soils. The results obtained were calculated on the basis of percentage of calcium carbonate or the approximate number of tons of calcium carbonate necessary to neutralize the soil acids to the depth of one foot assuming an acre of soil one foot deep weighs 3,000,000 lbs. This figure was called the "lime requirement." Much misconception has arisen over the use of this term. It certainly does not mean that on applying lime to a soil it is necessary in practice to add a quantity equivalent to the "lime requirement." Besides being out of the question owing to the expense incurred, the application of large quantities is against practical experience, in this country at any rate, and that excellent results can be obtained by the application of quantities below the "lime requirement" was definitely shown on Castleton Estate.[2] Owing to the unsatisfactory nature of the term "lime requirement" the writer has substituted "lime absorption." Having decided that the figure does not give the actual amount of lime to be applied in practice the question arises as to whether it bears any relation to that quantity. From the results of several hundred of soil analyses together with such scanty information as is obtainable of practical results there appears to be no direct general relation, although on restricted types of soil there is probably such a relation.

Further light is shed upon the relation between acidity and crop requirements in a recent paper by Truog of the Wisconsin Experiment Station.[3] He distinguishes between "active" and "latent" soil acidity, the former being that part of the acidity which immediately combines with a base. The latent acidity is only after more prolonged treatment or heating fully neutralized. Truog gives data showing that the active part of the acidity reacts within one minute while the reaction with latent acidity under the same conditions is still proceeding after 17 hours. The method described by Barrowcliff as

[1] *Agricultural Bulletin, F.M.S.*, Vol. 3, No. 2. "The Acidity of Malayan Soils."

[2] *Agricultural Bulletin, F.M.S.*, Vol. 4, No. 12, "Liming Experiments."

[3] *Journal of Industrial and Engineering Chemistry*, Vol. 8, p. 341.

used in this Department, therefore, though determining more than the active acidity probably does not determine the total acidity, but some intermediate quantity. It seems reasonable to suppose that the active acidity is much more injurious than the latent acidity, and hence a figure which includes part of the latent acidity might be expected to give results sometimes at variance with practice. Nor is this all A still more important point is raised by Truog—viz., the avidity of these active acids. By the avidity of an acid is meant its power of competing for a base in comparison with another acid taken as a standard. It is evident that the greater the avidity of the soil acids the greater is the degree of harm caused to crops. He instances two soils one a peat with an active acidity of 5.6 tons per acre, and another a sand, with an acidity of 3.4 tons per acre. The former in practice does not respond to liming whereas the latter does. When the relative avidities of the acids are compared it is seen that of the former is 15 while that of the latter is 113. These are no doubt extreme cases but they serve to show the importance of the determination of the avidity of the acids if the result of acidity determinations are to be useful in practice. They also afford another explanation of the failure to correlate "lime absorption" determinations with practical results. The very low avidity of the acids in the peat soil instanced by Truog is particularly interesting, in view of the failure to obtain any results from the application of lime in an experiment carried out by the department on a very acid peat soil in Selangor. No analyses have yet been made in this country for the determination of acid avidity in different soils but undoubtedly a new line of work is opened up which may be quite conceivably of great importance in the consideration of liming problems.

The methods proposed by Truog for the determination of the active acidity, the latent acidity and the avidity of the active acids may be outlined here.

Active acidity.—This is determined by agitating the fine sample of soil with baryta for exactly one minute. Carbon dioxide is then passed into the liquid changing the excess of baryta to carbonate. The liquid is evaporated to complete dryness on a water bath and the carbonate liberated by $\frac{1}{15}$ phosphoric acid the carbon dioxide being absorbed by baryta and estimated.

Latent acidity.—This is determined by boiling a quantity of the soil in baryta solution for half an hour, evaporating to dryness, and heating for $2\frac{1}{2}$ hours in the oven at 110°C. Water is then added and carbon dioxide passed through, the subsequent operations being the same as in the estimation of the active acidity. This gives the total acidity, the latent acidity being obtained by difference.

Avidity of the active acids.—Acetic acid is used as the standard acid and its avidity taken as 1,000. A quantity of the soil is added to a solution of potassium acetate containing a quantity equivalent to

the active acids. The soil and acetate are vigorously shaken together for two minutes and then quickly filtered and titrated with standard soda and phenolphthalein. Calculations are made as follows:

Let a=avidity of acetic acid.
b=cc standard soda used in titration.
c=cc standard potassium acetate used.
x=relative avidity of active soil acids.

then $\frac{x}{a}=\frac{b}{c-b.}$

This method depends on the relative insolubility of the soil acids and gives an approximately comparable figure for the avidity in different soils.

The degree of harmful acidity in the soil is measured by the product of the active acidity and the avidity of the active acids.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

held at No. 12, Market Street, Kuala Lumpur, on 27th December, 1916, at 11 a.m.

PRESENT:

Mr. Wm. Duncan (*in the Chair*)
„ H. C. E. Zacharias (*Secretary*)

and the following DELEGATES:

From Batu Tiga D.P.A.	Messrs. H. L. Jarvis and G. H. Bennett
„ Central Perak P.A. ...	Mr. J. S. Ferguson
„ Johore P.A.	Messrs. A. L. Buyers and J. H. Monson
„ Kajang D.P.A.	Mr. R. C. M. Kindersley
„ Kapar D.P.A.	Messrs. L. Mooijaart and A. Mahler
„ Klang D.P.A.	„ E. C. Wakefield and H. R. Quartley
„ Kuala Langat D.P.A. ...	„ R. W. Munro and F. H. Dale
„ Kuala Lumpur D.P.A. ...	„ A. J. Fox and C. J. Arnold
„ Kuala Selangor D.P.A. ...	„ R. S. McCulloch and L. A. Irving
„ Lower Perak P.A. ...	Mr. H. H. Park
„ Negri Sembilan P.A. ...	Messrs. J. Bruce, G. B. W. Gray and Geo. Grant

HONORARY MEMBER—Mr. L. Lewton-Brain (Director of Agriculture)

VISITORS—Messrs. R. Walshe (of Papua), R. K. Walker, H. E. G. Solbe, W. H. Bragg, Carlyle Bell and J. A. Brown.

1. The Minutes of the Meeting held on 25th October, having been printed and circulated, are taken as read.

Mr. MOOIJAART points out an error on page 4, line 22, where "Acting" should read "Assistant" and subject to that correction moves that the Minutes be confirmed.

Mr. WAKEFIELD seconds the proposal, which is carried; and the Minutes are signed by the Chairman.

2.—QUARANTINE CAMP AT PORT SWETTENHAM.

The SECRETARY reads the following letter:

"KUALA LUMPUR,
"*1st November, 1916.*

"No. 4328/16.

"SIR,

"I am directed by the Chief Secretary to convey to your Association an expression of his thanks for the copy of the report on

the Quarantine Camp at Port Swettenham prepared by Messrs. F. G. Harvey and G. H. Bennett, formal acknowledgment of which has already been sent to you. The Chief Secretary has read the report with interest and is very much obliged to these gentlemen for the trouble which they have taken in the matter.

"2. The recommendations made in the report have formed the subject of careful inquiry. As regards the recommendation that a medical officer should be stationed at the camp during the recruiting season, I am to explain that the intention is that an officer should always be stationed at Port Swettenham in charge of the camp and that it is only the exceptional shortage of medical officers at present that has made such an arrangement impossible. As regards the enlargement of the kitchen, it appears that the space available at present is ordinarily ample and that if at any time several infected ships arrived at the same time, temporary extension to meet temporary needs can be arranged by making use of an adjoining shed.

"It is agreed that a light railway, such as that suggested, would facilitate the working of the camp, but it is improbable that materials for such a purpose could be obtained at a reasonable cost, if at all, during the continuance of the war in Europe.

"There would be difficulties regarding the construction of the latrines recommended in the report. The existing salt-water tank is already called upon to its utmost capacity and if a flushing arrangement for the latrines were contemplated, it would be necessary to erect an additional pumping station, and the Chief Secretary is advised that this would be an expense which would hardly be justified for the purpose in view.

"I have, etc.,
"(Sd.) S. McArthur,
"*Under Secretary, F.M.S.*

"The Secretary,
"Planters' Association of Malaya,
"Kuala Lumpur."

Mr. Munro says it was satisfactory to note that the Government had arranged for a roster of visiting planters.

Mr. Duncan agrees and regrets that it was not possible for the time being to give effect to the other recommendations of the Sub-Committee. He trusted, however, that these matters would not be lost sight of, so that when a more opportune moment arrived they would be taken in hand.

The Secretary is instructed to reply accordingly.

3.—QUARANTINE CAMP AT PENANG.

The SECRETARY reports that this matter had been placed on the agenda at the request of the Central Perak Association on account of an outbreak of measles on one of their estates.

Mr. FERGUSON submits correspondence with the Immigration Authorities on the subject. The question was a serious one and he regrets that the Immigration Committee seemed disinclined to make the necessary changes in connection with the quarantining of immigrant coolies at Penang. He requests the Planters' Association of Malaya to take up the question.

Mr. MOOIJAART feels that a technical point of this nature could not usefully be discussed at a general meeting like the present one, and that the proper way of dealing with it was to refer the whole question to the Standing Committee who would consult experts and decide on what was the best thing to be done.

Mr. DUNCAN agrees with the first part of Mr. Mooijaart's contention, but observes that the quarantine camps in this country had been established not against all, but only against some, specified diseases, such as cholera, plague and small-pox. The reason why measles were not included was the fact that the incubation period of measles was very long indeed, and it was obviously not desirable from their point of view to keep all immigrants on arrival for long periods in quarantine, on the off chance of their developing measles. The subject had been brought up at the last meeting of the Immigration Committee and it was shown that the course adopted in the case of coolies who showed during their segregation signs of measles was that they were detained, but not unless those signs appeared. If measles only came out after the coolies' arrival on the estate, it surely was for the estate to deal with the matter. Personally, he did not favour any alteration in the present conditions of quarantine, and he would be glad to hear whether, after the explanation given, Mr. Ferguson was still desirous of instructing the Standing Committee to take any action.

Mr. FERGUSON declaring himself satisfied with the explanation given, the matter is dropped.

4.—TODDY.

Mr. MOOIJAART draws attention to the Excise Amendment Enactment which had come into force on the 1st, and to the new Toddy-shop Rules, taking the place of schedule C of Excise Enactment, 1915. As they were aware, whilst the Toddy Committee of which he had been a member, had concluded its work, another Toddy Commission had since been appointed and as this latter was still sitting, he preferred to defer certain observations, he felt bound to make. With their approval, he would like to submit at an early date a memorandum reviewing the whole subject.

Mr. MONSON has much pleasure in informing the meeting that the Johore Government was taking up a very sympathetic attitude, as would be seen from the following letter, recently received by him:

"JOHORE BAHRU,
"*9th December, 1916.*

"No. S.S. 1069/16.

"SIR,

"I have the honour to inform you that this Government has decided to abolish the monopoly held by the toddy farmer in Johore as from 1st January, 1917, and will not relet the farm.

"2. The fee for a licence to sell toddy will be raised from $1.50 per mensem to $6 per mensem.

"3. The various Licensing Boards have been instructed as far as possible to consult the planters and ascertain their wishes before leave is granted for the issue of licences in the neighbourhood of their estates. It is hoped that the Licensing Boards will receive the co-operation of your Association when asked for as regards the issue of licences.

"4. Any complaints against licensees made by any individual planter or by your Association will always receive the careful attention of the Licensing Boards.

"I have, etc.,

"(Sd.) F. J. WELD,
"*Acting General Adviser.*

"THE HONORARY SECRETARY,
"JOHORE PLANTERS' ASSOCIATION,
"BATU ANAM."

(Applause.)

Mr. DUNCAN wishes first of all to express the thanks of the Association for all the work already done by Mr. Mooijaart for them regarding toddy and to say that they would gladly have the memorandum promised by him.

As regards Johore, the action there taken seemed very satisfactory, inasmuch as it bespoke a readiness of the Government to co-operate with the planters in this important matter. Altogether, it was encouraging to see that the authorities generally seemed to become more alive to the problem, for a solution of which they had been agitating for so long.

5.—WAR RELIEF.

The SECRETARY reports the receipt of the following contributions from 1st April, 1916, to date:

Batang Padang	$ 617.77
Batu Tiga	2,285.00
Central Perak	1,838.44
Kajang	1,137.00
Kapar	2,501.70
Klang	4,800.00
Krian	1,444.19
Kuala Langat	725.00
Kuala Lumpur	1,370.06
Kuala Selangor	1,680.04
Lower Perak	659.00
Negri Sembilan	2,052.90
Taiping	2,910.61
Ulu Selangor	1,984.13
Total F.M.S. ...	26,005.84
Penang and Province Wellesley ...	803.63
Johore	2,773.00
Kedah	667.66
Kelantan	820.39
Grand Total ...	$31,070.52

out of which sum, £3,500 had been remitted to Sir William Taylor.

The Rubber Growers' Association had sent him the following abstract of their collections:

10th October, 1916.

THE RUBBER GROWERS' ASSOCIATION. (INCORPORATED).
WAR RELIEF FUND (MALAYA).

	Amount received.		Promises. (Amounts not yet received).	
	1915.	1916.	1916.	1917.
	£ s. d.	£ s. d.	£ s.	£ s. d.
Companies—				
On acreage basis	2,793 11 10	... ...	3,153 7	3,540 7 6
Lump sum donations ...	1,589 11 0	216 12 6 ...	400 0	400 0 0 (Subject to Div.)
	4,383 2 10	216 12 6 ...	3,553 7	3,940 7 6
Individuals ...	874 14 0	... ...	5 0	5 0 0
Total ...	5,257 16 10	216 12 6 ...	3,558 7	3,945 7 6

The SECRETARY reads the following two letters from Sir William Taylor:

"88, CANNON STREET,
"LONDON, E.C.

"SIR,

"WAR RELIEF FUND—No. 2.

"I have the honour to acknowledge the receipt of your letter of 1st September.

"Since I wrote to you on 19th and 27th July, I have been in communication with the authorities at Singapore as to the Governments of the Straits Settlements and Johore contributing in the cases of relief given from this fund to persons connected with the Colony and Johore. I hope the outcome will be entirely satisfactory.

"I would ask you to be so good as to inform me what amount has been contributed through the agency of your Association to the War Relief Fund.

"In my letter of 29th July, I mentioned that the Committee was considering the application of Mrs. ——, mother of the late Mr. ——, for some time a Divisional Superintendent on - — Rubber Estates. The Committee made a grant of £25 to Mrs. —— and now await certain information from her with a view to further consideration of her application.

"A grant of £50 was made to Mrs. ——, mother of ——, an assistant on —— Estate, who was killed in Gallipoli last year. When the result of Mrs.——'s application to the War Office for a pension is known, her case will be further considered.

"Mr. ——, late Manager of —— Estate, who was released from military service in August last on account of ill-health, the result of service in Gallipoli, applied to the Committee for assistance. The Committee made a grant of £25 to him, and the representation which, on behalf of the Committee, I made to the War Office has resulted in Mr. —— being called up for examination with a view to the grant of a pension. The result is not yet known.

"Mr.——was discharged from hospital on the 1st instant. He has been given a Corporal's pension (temporary) of 14*s*. 6*d*. a week. I believe this will be supplemented by the Committee to make it equal to a Second Lieutenant's pension.

"I am, Sir,
"Your Obedient Servant,
"(Sd.) WILLIAM TAYLOR.

"THE SECRETARY,
"PLANTER'S ASSOCIATION OF MALAYA."

"LONDON,
"*26th October, 1916.*

"SIR,

F.M.S. WAR RELIEF FUND—No. 2.

"I have the honour to acknowledge the receipt to-day of your letter of the 21st September.

"In connection with the registration of the fund under the War Charities Act, 1915, the Charity Commissioners expressed the opinion that there should be a Secretary. To meet this, I have asked, with the approval of the Executive Committee, Mr. A. Hale, to act as Honorary Secretary and he has kindly consented to do so.

"The Executive Committee, at a meeting yesterday, approved a further grant of £20 to Mr. P. Gow to be expended for the benefit of ——who is still in hospital, and is likely to be there for some months.

"The Committee had under consideration the case of Mr.——, of —— Estate, Labis, who is in receipt of a pension from the War Office of 14*s.* 6*d.* a week. The Committee desired to supplement this but, in view of the ruling of the Johore Government, could not exceed the pension to a Second Lieutenant. So many rates are possible for a Second Lieutenant that a further reference to the War Office is necessary. Mr.——'s pension will be increased meantime to 30*s.* a week, to be adjusted when further information is available.

"The Committee approved a second grant to Mrs.——(*vide* your letter of the 5th May last) of £50 in respect of the year 1916-1917.

"Mr.——has been granted by the War Office a pension of £150 per annum, in view of which he has withdrawn his application for assistance from the fund.

"I am, etc.,
"(Sd.) WILLIAM TAYLOR.

"THE HONORARY SECRETARY,
"F.M.S. WAR RELIEF FUND,
"KUALA LUMPUR."

The SECRETARY continues that from the above the meeting would see that the fund was being increasingly drawn upon. As there had seemed in some quarters an idea that the amount already collected was more than was required, he had obtained through the courtesy of the Secretary of the Rubber Growers' Association some figures as to the cost of annuities—*viz.*:

"COPIES OF LETTERS RECEIVED FROM ASSURANCE COMPANIES *re* ANNUITIES. GUARDIAN ASSURANCE CO., LTD., DATED 7TH OCTOBER, 1916.

"I beg to acknowledge the receipt of your letter of the 5th instant, and with reference to your enquiry, I have the pleasure to inform you that the single premium for an annuity certain of £10

per annum during a term of 30 years, the first payment due one year from the date of purchase would be £196, if the annuity were payable annually, or £197 9*s.* 4*d.* if payable by equal half-yearly instalments, the first due six months from the date of purchase. As indicated above, the payment of the annuity would be independent of any contingency but if it should be desired to terminate the transaction before the expiration of the original term a surrender value would be allowed according to the conditions stated in the enclosed prospectus of sinking fund assurances, which, when applied to the case of an annuity of £10 payable annually for 30 years would yield the following results after various periods:

"Number of annuity payments remaining to be paid.		Surrender value on next date of payment.
25	...	£166
20	...	142
15	...	114
10	...	82
5	...	44

"I enclose a few prospectuses with forms of proposal annexed which should be completed and returned to this office if the matter is to proceed, and I shall be happy to give you any further information or explanation that may be desired.

"P. S.—The prices and surrender values of annuities of other amounts would be in proportion to the above."

"SUN LIFE ASSURANCE OF CANADA, DATED 6TH OCTOBER, 1916.

"We beg to acknowledge receipt of your favour of the 5th instant and have to advise you that for an annuity of £100 a year payable for 30 years, we shall require a purchase price of £1,772 10*s.* The cost of an annuity of £50 for 30 years would be exactly half the above-mentioned figure. The annuity would be paid in half-yearly payments, the first payment being made six months from the date we receive the purchase money.

"We regret that we have no leaflet dealing with this class of policy but enclose a pamphlet regarding the various policies issued by this company.

"Trusting you will find our quotation satisfactory."

"PRUDENTIAL ASSURANCE CO., LTD., DATED 10TH OCTOBER, 1916.

"I am in receipt of your letter and have to inform you that for £100 purchase money we can grant an annuity of £5 8*s.* 2*d.*, payable by half-yearly instalments of £2 14*s.* 1*d.* for a term of 30 years.

"The purchase money required for a similar annuity of £100 per annum would be £1,849.

"We have no literature dealing with this class of contract."

They all hoped that recipients of annuities from the fund would live much longer than 30 years from the time they commenced drawing them, but taking this as an average figure and assuming that an annuity of £60 was to be paid, they would see that the most favourable quotation entailed a capital outlay of $9,000 for each case. For 50 cases, therefore, a capital of something like half a million dollars was needed, and they were unfortunately still a long way off that sum. Yet, annuities for 50 planters out of the many, many hundreds that had gone to the war, seemed a very conservative estimate to make.

There was one other matter he had to touch upon in this connection and that was the "Star and Garter Hospital Fund," for which he had received the following contributions:

From Kuala Selangor	$175
„ Johore	100
„ Lower Perak	55
„ Batu Tiga	30
„ Kedah	20
„ Dindings	10
Total ...	$390

With their permission, he now proposed to close this fund and to remit the total collected to the proper quarters.

Mr. DUNCAN, after the facts reported by the Secretary, feels he need add no words of his own to prevent any possible falling off in subscriptions: the more they gave, the greater the relief they would, eventually, be able to grant to those fellow-planters who had got broken in the war or to the dependents of those who had made the great sacrifice of life itself.

6.—RUBBER THEFTS.

The SECRETARY reports that the Standing Committee had drawn up a memorandum, as instructed at the last meeting, and that this had been forwarded to the Council of the Rubber Growers' Association with a request to lay the matter before the Secretary of State for the Colonies.

The memorandum is read as follows:

MEMORANDUM *re* RUBBER AND LATEX THEFTS.

Historical.—"The Federal Rubber Dealers' Enactment, 1909," was one of the first legislative measures passed by the Federal Council when constituted in 1909, and owes its inception entirely to the Planters' Association of Malaya, who, for months before, had been making representations to the then Resident-General that legislation

for the purpose of licensing and controlling dealers in rubber had become a necessity owing to the alarming rate at which stealing of rubber and latex was increasing.

The Legal Adviser of the Planters' Association of Malaya, Mr. G. H. Day, then drafted a Bill which was brought forward by Mr. R. W. Harrison, a member of the Council, and after a certain number of amendments, this Bill was finally passed and became law in the Federated Malay States as from 21st December, 1909.

It is interesting to recall the remarks made at the Federal Council Meeting during the discussion of this Bill. The Resident-General, Sir William Taylor, for instance, said:

"We all know how important to the country is the rubber industry, and how this industry has grown in importance during the past few years until it has become a very important factor in the welfare of these States. We know that a large amount of capital has been invested and look forward to its development. With the development of the industry there have also developed certain abuses, and one of these has been rubber stealing, and of late thefts of rubber have shown a tendency to increase. Rubber is so valuable and so portable that it offers very easy and attractive opportunities to dishonest persons, and rubber growers have turned to the Government, not without reason and with some justification, to ask for assistance in dealing with this question. They have asked the Government that they should not only deal with people who steal, but that they should also assist in protecting them from the receivers of stolen rubber. I understand that Government is willing to render assistance. Of course, the Government would not undertake the protection of the rubber estates nor would it be prepared to relieve the rubber growers from their bounden duty of guarding their own estates, but it is prepared to assist them, provided it can be done in such a way as not to be injurious to the industry and that it does not harass those who are concerned in the industry.

"The rubber growers have asked the Government to give them the same protection that they believe has been given to the miners by the Mineral Ores Enactment, on the lines of which this Enactment has been drafted. The Enactment has not been drafted by the Government and is not in the form it would probably have taken had it been so drafted, but it was decided to bring it before the Council in its present form.

"It provides for the licensing of persons purchasing, etc., rubber, for search of premises, that dealers shall keep books showing their transactions, and shall produce their books for inspection. It also provides for the making of rules by the authorities for the further control of the sale, purchase, etc., of rubber, and penalties for breaches of the law in the usual way. The penalties provided being, I should say, of an exceptionally heavy nature."

Mr. Osborne from his experience of tin mining referred to the amount of illicit dealing in tin-ore in Perak which was at one time very large, before the introduction of the Mineral Ores Enactment and described methods by which illicit ore was secretly received and bought for at much less than the real value.

The Resident of Selangor, Mr. H. C. Belfield, also agreed that the number of dealers should be kept within reasonable limits.

Generally speaking, the consideration which decided the High Commissioner (Sir John Anderson) and the Council to adopt the Bill was the analogous history of the tin industry and the necessity which that industry had found itself under of being protected by a special legislative and administrative measure to prevent the receiving of stolen tin-ore.

Rubber, fully as valuable as tin, being equally open to practices of illicit dealing, it seemed obvious, when the Mineral Ores Enactment had stopped so grave an abuse in the tin industry, that similar steps would be equally productive of good results in the rubber industry.

The advent of the Rubber Dealers' Enactment was hailed by the Planters' Association of Malaya with the greatest satisfaction, and the Resident-General in a letter dated the 8th December, 1909, was informed of a resolution passed with acclamation to express to him the thanks of the Association for the great trouble taken by him over the Bill and for the careful consideration given to the representations of the Association.

Unfortunately, as time went by, it was found that the mere passing of an Enactment was insufficient to check the abuses it was intended to deal with, unless steps were taken to provide an adequate staff to carry out the provisions of the Enactment.

Having given the Government sufficient time to get things into working order, the Association on the 24th June, 1913, wrote to the Under Secretary of the Federated Malay States and the Colonial Secretary, Straits Settlements, drawing their attention to the fact that hardly any benefits had so far been obtained from the law, owing to the fact that no special machinery had been provided to administer it. Section 7 (i) would seem to throw the work on land and police officers, but it was quite evident that this arrangement was not satisfactory, and it was therefore submitted that a special branch of the Customs Department be formed and special inspectors under the Enactment be appointed on the lines of the inspectors appointed under the Mineral Ores Enactment.

After the lapse of six months, the Under Secretary on the 4th December, 1913, replied that the subject had been enquired into and references been made to the Residents [*sic!*] of all the States of the Federation, but that the Government had not been placed in possession of evidence to show that there was any necessity for a

more stringent administration of the provisions of the Enactment. He informed the Association that, when the Enactment was passed in 1909, it had not been the intention of the Government to appoint a special staff to administer it, as it was considered that the existing staff of the Land and District Offices was sufficient for the purpose. Since that time there had been appointed Agricultural Inspectors who had statutory powers of inspection under the Enactment, and instructions had been given to those officers to inspect the books of account of licensed dealers or owners and treaters of rubber, but that the Government was not prepared to assent to the suggestion that a special branch of the Customs Department be formed.

The Association then assumed that these Agricultural Inspectors would take up the matter and that steps were about to be taken in real earnest to carry out the Enactment which had been a dead letter during the whole of the four years that it had been on the statute book.

The expectations of the Association, however, were once more doomed to disappointment and no material improvement was obtained. The outbreak of the war shortly afterwards further suspended action on our part, but in the early part of this year the matter was once more taken up and all that this Association then asked was for a small Committee to be formed consisting of both Government officers and planters to go into the whole question and if possible, devise a remedy.

It will be noted that this Association did not ask for any action, drastic or otherwise, but merely suggested the formation of a Committee to consider whether there was any ground for complaint and, if so, how the situation could be met. It is surely most regrettable that so modest a request was turned down by the Government who once more, as in 1913, apparently made departmental enquiries and on the strength of them decided that an increase in the number of rubber thefts could not be considered a matter for great surprise seeing the enormous increase in the production of this valuable article, and that the Government was consequently satisfied that no action on the part of the Government was necessary but that, on the contrary, it appeared to the Government that owners of rubber estates did merely not take adequate measures to protect their valuable produce from the depredation of thieves (*vide* letter from Under Secretary, dated 25th July, 1916).

It is difficult to imagine a more unsympathetic attitude; an attitude which has consistently been taken by the Government of the Federated Malay States during the last three years. It will be noticed that the Government are in the habit of making enquiries from the Residents (and from the Commissioner of Police) only and it is surely curious, to say the least, that they do not wish to hear what evidence the planters themselves can put forward, nor have even

considered it desirable to consult their own Department of Agriculture, the Director of which, in his Annual Report for 1915, speaking about the Rubber Dealers' Enactment makes the following remarks:

"The practical difficulties in the administration of this Enactment have formed the subject of recent correspondence and are still under consideration. The lack of an adequate staff for the purpose and the fact that in a great many cases books of accounts are kept in Chinese are the principal handicaps to efficient control.

"The Chief Agricultural Inspector reports that, in Perak North, most of the licensed dealers' premises have been regularly inspected and the Assistant Agricultural Inspector has induced the majority of the dealers in the Kuala Kangsar district and all of these in the township to keep their accounts in English; but elsewhere, he has not been able to do this. It is reported, however, that even where books are kept in English and appear to be in order rubber stealing continues.

"In Perak South, 17 premises were inspected and one licensee was reported to the District Officer, Kinta, for neglecting to renew his licence. He was cautioned.

"In Selangor and Negri Sembilan, it is reported that practically nothing was done as all accounts are kept in Chinese and the officers of this department are consequently unable to obtain any information from them."

2. *The Present Situation.*—It is, therefore, on official record that the administration of this Enactment is not efficiently carried out.

This Association has in addition collected evidence from its own members which evidence has been published in the Minutes of the Meetings of 26th April, 30th August and 25th October, copies of which are attached. It is obvious that a private body cannot hope to produce any exhaustive evidence, but it is difficult to see how with the material before them any unbiased person can still maintain that the evidence is not sufficiently strong to warrant remedial measures.

His Excellency the High Commissioner at the Federal Council Meeting held on 16th November, again considered it not surprising that the number of rubber thefts should be on the increase when it was remembered that rubber of the value of 93 million dollars was exported from the Federated Malay States in 1915.

This argument is surely a curious one to use when the Federated Malay States export of tin during the same year 1915 amounted to 61 million dollars, and when during that time there have been no complaints amongst tin miners of dealings in tin stolen from private owners. Clearly the absence of these thefts in the tin industry and the prevalence of them in the rubber industry is only to be accounted for by the fact that whilst the Mineral Ores Enactment is being effectively carried out, the Rubber Dealers' Enactment is not. His Excellency the High Commissioner at the same Federal Council

Meeting is further reported to have said that the Government were perfectly willing, if a system could be devised which would not fall heavily on the small holders, to consider it: which bespeaks a greater readiness to consider the requirements of the rubber industry than the *non possumus* attitude of the Federal Government.

Quite apart from the great and growing injury that is being done to the rubber industry, it must be obvious that toleration of a state of affairs which results in open defiance of the law, in flagrant thefts and dealings in stolen property means the abdication of all Government, and it is difficult to understand how measures can be thought to operate hardly on the small cultivator when their only possible effect could be to prevent dishonesty.

With an article as valuable and portable as rubber, the temptation for labourers employed on estates must necessarily be very great, and the only way to stop thieving is to stop the dealing in stolen rubber. It is obvious, that once stolen rubber cannot be disposed of, the incentive for stealing rubber would at the same time disappear.

The Government re-iterate every time, on their being approached, that owners of rubber estates fail in their duty of protecting their property adequately. Nobody who is conversant with the elaborate method of checks and the number of watchmen employed on large estates can fail to see that such contention is altogether fatuous. The only "adequate" means of preventing thefts is to have an army of constables watching every cooly during work hours and every rubber tree during the night. Even in that case, however, there is no guarantee that these constables should prove more honest than the labourers whom they are supposed to watch.

The whole burden of the Government's attitude is that nothing must be done which in any way would interfere with the Malay small-holders, but except that he would not be able to profit by dishonesty, the remedies which suggest themselves would in no way result in making it impossible for him to obtain the best price for his product or put any undue restrictions generally on the cultivation of rubber by small-holders.

With the price of rubber which has hitherto ruled the profits made by rubber small-holders have been very great, and in its anxiety for the welfare of its people the Government apparently are still under the illusion that this cultivation requires its fostering care. It is a fact that the Government of the Federated Malay States have not yet thought it necessary to take a census of the area under rubber cultivation, where a holding is of less than 100 acres. It is an open secret that the taking of these statistics has been left to a private foreign concern. The figures thus obtained will, in a few years' time, no doubt become officially known to the Government who will then learn that more than a quarter million

acres of rubber are cultivated in the Malay Peninsula by smallholders, and it will then perhaps be evident to them that this is not a small struggling industry, the peccadilloes of which ought to be winked at by the Government.

The remedies, therefore, which this Association puts forward can by no stretch of imagination be thought to act harshly on the smallholders, since, with such an industry to cater for, the resident Chinese business community may be trusted to avail themselves to the full of their opportunities; and to anybody who knows the Chinese trader, it is equally obvious that there will be no lack of competition, even if an efficient Government control should in future make it more difficult for these dealers to receive and deal in stolen rubber.

3. *Proposed Remedies.*—(i) The first point that this Association presses for is that a staff be provided for carrying out the existing Rubber Dealers' Enactment, by strengthening the staff of Agricultural Inspectors and by amending the Enactment so as to make the keeping of accounts in English or Romanized Malay compulsory.

(ii) Further points requiring attention: (1) The number of dealers should be restricted, as the present indiscriminate licensing of dealers makes a proper control of them necessarily very difficult. It is, therefore, suggested that the licensing fee be increased from $25 to $100 per annum and the security from a deposit of $200 to two securities of $1,000 each, the tendency of which would be for the buying to get into the hands of less numerous but more reputable dealers, the fee thus suggested being that now paid by tin-ore buyers;

(2) Provision should be made, so that part of the fine may go as rewards to informers;

(3) There should be a minimum quantity fixed for sale, say 25 or 50 katties, and no barter be allowed (at the present time, it is not unusual for people to exchange a pocketful of rubber for a packet of cigarettes);

(4) Dealers should not be allowed to carry on any other business on the premises except the buying and selling of rubber and should have definite closing hours;

(5) Dealers' books should be balanced daily to show the quantity of stock they are carrying.

For the Standing Committee of the
Planters' Association of Malaya:

H. C. E. Zacharias,
Secretary.

Kuala Lumpur,
7th December, 1916.

(Applause.)

The SECRETARY lays on table abstract of further thefts reported to him during October and November, as follows:

RUBBER THEFTS DURING OCTOBER, 1916.

Kuala Pilah District Report 824/16	Theft of rubber, value $50 ...	No arrest
Kuala Pilah District Report 889/16	Lim Yong Sam, section 9 (ii), Wong Ah Hee, Enactment 5, 1900	No case
Kuala Pilah District Report 1,218/16	Choo Hai, section 8 (i) (*b*), Enactment 5, 1909	Discharged
Bukit Nanas Div. Linggi Plantations, Ltd.	Two Chinese women stealing scrap rubber. Thefts had been going on for a considerable time; these were the first persons caught, a collection of scrap rubber was found in houses occupied by accused	Each sentenced to three months' rigorous imprisonment, Seremban Court
Kajang District No. 1	Theft of scrap rubber and coagulated rubber left in the cups the previous day, value about $2, by three coolies on 8th October	Fined $25 each
Heawood Tin and Rubber Estate, Ltd.	A tin containing 6 lbs. of No. 1 latex was found embedded in the ground at the base of a tree covered by a piece of wood. The Tamil cooly who daily tapped the tree on being questioned admitted having placed the tin with intention of, when full, selling the contents to a Chinaman, the owner of an adjacent kedai, who was in the habit of buying No. 1 latex at 15 cents per lb. and giving tea, etc., in exchange. Six coolies eventually admitted having sold to the Chinaman	Warrant refused
Sengat Estate	Serious damage by night tapping by some person or persons unknown through an area of 10 acres of oldest rubber on 11th October	

Jendarata Estate	Four hundred and fifty trees tapped on 12th October, involving a loss of about 8 lbs. of rubber and damaging the trees	
Do.	Four hundred trees tapped on the night of the 14th October	
Val d'Or Estates	After numerous complaints to the Police *re* native kedais receiving stolen rubber, cases in the district of Tassek and Sungei Bakap were tried. Four shopkeepers were arrested, and brought to the District Court	No. 1 discharged No. 2 $800 fine No. 3 $500 fine No. 4 discharged

RUBBER THEFTS DURING NOVEMBER, 1916.

Jawie Estate ...	Factory was broken into and one case containing 187 lbs. of smoked sheet and 314 lbs. of loose sheet were stolen. No trace of the stolen rubber	No arrest
Gedong Estate	Four Malays caught attempting theft of 10 cases smoked sheet, weighing about 1,870 lbs., taken out of shipping store, situated at the jetty near the river. The rubber was about to be carried in a sampan which was also seized. Twelve sacks were found in the sampan, out of which 10 cases only had thus far been abstracted. The thieves carried a gun	
Kajang District No. 1	25th November 2,000 rubber stumps (14 months old) stolen, value about $70. No trace	
Jendarata ...	Five hundred trees tapped on the night of the 8th November	

The SECRETARY further reports that an Enactment (No. 19 of 1916) had come in force on the 1st, regularizing the sale of rubber by public auctions.

There had also been published the Bill of another Rubber Dealers' Amendment Enactment, which was designed to carry out recommendation (i) of the memorandum just read out by him. He understands that this remedial measure had been conceded to the Federated Malay States Chamber of Commerce, who had put forward this specific recommendation; although the last word the Government had had for the Planters' Association of Malaya (less than six

months ago) was that they were "satisfied that no action on the part of the Government was necessary" (*vide* Under Secretary's letter of 25th July, 1916).

Mr. MUNRO considers that as a reply to this letter they ought to send Government a copy of the memorandum, which had gone forward to the Rubber Growers' Association.

Mr. DUNCAN concurs that it was desirable that the Chief Secretary should receive a copy and hopes that it would lead to further relief being given.

The Secretary is instructed accordingly.

7.—CHINESE LABOUR.

The SECRETARY reads the following correspondence:

"KUALA LUMPUR,
"*16th November, 1916.*

"DEAR SIR,

"Reverting to the resolution passed at the last meeting of this Association regarding the formation of a Special Committee to report on the recruiting, etc., of Chinese labour, I am instructed to ask if you will kindly nominate two members of your Association to serve thereon.

"Believe me, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"F. A. WRIGHT, ESQ.,
"SECRETARY,
"NEGRI SEMBILAN PLANTERS' ASSOCIATION,
"SEREMBAN."

"KUALA LUMPUR,
"*16th November, 1916.*

"DEAR SIR,

"Reverting to the resolution passed at the last meeting of this Association regarding the formation of a Special Committee to report on the recruiting, etc., of Chinese labour, I am instructed to ask if you will kindly nominate one member of your Association to serve thereon.

"Believe me, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"J. H. MONSON, ESQ.,
"HON. SECRETARY,
"JOHORE PLANTERS' ASSOCIATION,
"SEDENAK,
"JOHORE."

"KUALA LUMPUR,
"*16th November, 1916.*

"DEAR SIR,

"Reverting to the resolution passed at the last meeting of this Association regarding the formation of a Special Committee to report on the recruiting, etc., of Chinese labour, I am instructed to ask if you will kindly nominate one member of your Association to serve thereon.

"Believe me, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"W. C. PAYNE, ESQ.,
"SECRETARY,
"CENTRAL PERAK PLANTERS' ASSOCIATION,
"IPOH."

"SEREMBAN,
"*23rd November, 1916.*

"DEAR SIR,

"Replying to your letter dated 16th November, 1916, I beg to inform you that at a general meeting of this Association held on 18th November last, Messrs. J. Rea and V. A. Tayler were nominated to serve on the Special Committee to report on the recruiting, etc., of Chinese labour.

"Yours faithfully,
"NEGRI SEMBILAN PLANTERS' ASSOCIATION,
"(Sd.) FRANCIS A. WRIGHT,
"*Secretary.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"IPOH,
"*4th December, 1916.*

"DEAR SIR,

"At a Committee Meeting held on Saturday, 2nd instant, Mr. W. R. Shelton Agar was nominated as the Association's member to serve upon the Special Committee to report on the recruiting, etc., of Chinese labour.

"Yours, faithfully,
"CENTRAL PERAK PLANTERS' ASSOCIATION,
"(Sd.) W. CECIL PAYNE,
"*Secretary.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"SEDANAK,
"*12th December, 1916.*

"DEAR SIR,

"I am instructed to forward the name of Mr. A. L. Buyers to serve in the Special Committee to report on the recruiting, etc., of Chinese labour. Mr. W. N. Gawler will serve in the event of Mr. Buyers not being able to attend at any particular meeting.

"Yours, faithfully,
"(Sd.) J. H. MONSON,
"*Hon. Secretary.*

"H. C. E. ZACHARIAS, ESQ.,
"SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*23rd November, 1916.*

"SIR,

"I have the honour to inform you that at the last general meeting of this Association held on the 25th ultimo the following resolution was passed in regard to Chinese labour:

> 'That a Special Committee be appointed to go into the whole matter and formulate a scheme for the approval of the Planters' Association of Malaya, such Committee to consist of eight members, of whom the Federated Malay States Chamber of Mines be invited to appoint one of their Chinese and one of their European members; that the Government be invited to detail the Controller of Labour; and that the Planters' Association of Malaya appoint four representatives of their own and in addition invite one Chinese planter to serve on the Committee';

and I shall, therefore, be glad to hear whether you will detail the Controller of Labour or his substitute to sit on this Special Committee as aforesaid.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*2nd December, 1916.*

"No. 5466/16.

"SIR,

"I am directed by the Chief Secretary to acknowledge receipt of your letter of the 23rd November, 1916, on the subject of a resolution passed at the last general meeting of the Planters' Association of Malaya held on the 25th October, 1916, in regard to Chinese labour.

"2. As it will be necessary to ask the Controller of Labour to advise the Government regarding any proposal that may be made in connection with Chinese labour, it is not considered expedient that he or his deputy should form one of the proposed Committee. Should, however, the Planters' Association of Malaya formulate any recommendations on the subject, it might be considered advisable to appoint a Committee on which the Government would be represented, and in that event, the Controller of Labour would doubtless be one of those appointed.

"I have, etc.,
"(Sd.) W. MACKRAY,
"*for Under Secretary, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. DUNCAN points out that the resolution passed at the last meeting referred to a Committee, of which the Controller of Labour was to be an integral member. After hearing the reply from the Under Secretary, the proposal as it stood had fallen to the ground. He enquires, whether there was any other proposition to be placed before the meeting.

There being no response, the meeting proceeds to the next point on the agenda.

8.—BAGAN DATOH.

The SECRETARY reads the following correspondence:

"KUALA LUMPUR,
"*31st October, 1916.*

"SIR,

"BAGON DATOH.

"I have the honour to inform you that at a general meeting of this Association held on the 25th instant, the present unsatisfactory system of outlet drains and water gates in the Bagan Datoh district was made the subject of a strong complaint. The system in question appears to be quite inadequate and thereby causes grave danger

to the coconut cultivation of the whole district, and I was instructed accordingly to draw your attention to this matter and to solicit the early initiation of remedial measures.

"I have, etc.,
"(Sd.) H. G. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*10th November, 1916.*

"No. 5075/16.

"SIR,

"With reference to your letter of the 31st October, 1916, on the subject of the system of outlet drains and water gates in the Bagan Datoh district, I am directed to inform you that your letter has been referred to the British Resident, Perak, as the question therein referred to is one which affects that State only.

"2. The Chief Secretary will be obliged if you will communicate any information you may have direct to the Perak Government.

"I have, etc.,
"(Sd.) W. MACKRAY,
"*for Under Secretary, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"THE SECRETARIAT,
"TAIPING,
"*22nd December, 1916.*

"No. (2) in 5889/16.

"SIR,

"Referring to your letter dated 31st October, 1916, addressed to the Under Secretary, Federated Malay States, on the subject of the unsatisfactory system of outlet drains and water gates in the Bagan Datoh district, I am directed to say that the Acting Resident has asked the State Engineer to look into the matter and will report again after that officer and the Director of Public Works have studied the question on the ground in January next.

"I have, etc.,
"(Sd.) OLIVER MARKS,
"*Secretary to Resident, Perak.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

9.—ELEPHANTS.

The SECRETARY reports having written to the Under Secretary, as instructed at the last meeting—*viz.*:

"KUALA LUMPUR,
"*31st October, 1916.*

"Sir,

"I have the honour to acknowledge your letter No. 4923/15 of the 25th September which I submitted to our members at their last meeting on the 25th instant.

"The members of this Association have noted with pleasure the success of the experiment carried on by the Government during the time mentioned, and I was instructed to convey to you their thanks accordingly. At the same time the Association wishes me to inform you that they cannot agree to the principle, that the Government is not responsible for the damage done by elephants whose habitat is a Government game reserve.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
Secretary.

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
KUALA LUMPUR."

10.—AGRICULTURAL CONFERENCE.

The SECRETARY reports having written the following letter:

"KUALA LUMPUR,
"*16th November, 1916.*

"Sir,

"I have the honour to acknowledge receipt of your letter 1 in 1913 of 28th September and in reply beg to say that this Association is in complete agreement with you about the advisability of arranging for an Annual Agricultural Conference in conjunction with the Annual General Meeting of this Association and I am inviting Messrs. Harvey, Kindersley and Munro to act as a small Committee to arrange matters with you.

I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"DIRECTOR OF AGRICULTURE,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

Mr. MUNRO observes that Mr. Harvey was away on leave for some time and suggests the addition of another member.

Mr. JARVIS agrees and proposes Mr. Mooijaart.

Mr. FERGUSON seconds the proposal, which is carried.

11.—WAR TAXATION.

Mr. DUNCAN observes that this subject did not appear on the agenda, but they would all have seen a Draft Enactment, which had only been gazetted on the 23rd, specifying the recommendations of a War Taxation Committee, which had been appointed in accordance with a resolution of the Federal Council passed on 14th November, 1916, to consider the question of a contribution for war purposes. There was another meeting of the Federal Council to-morrow and he considered it right that they should discuss these proposals now and place the result of the discussions before the Government, before they met. As they were aware, the Federal Council Committee proposed that the export duty should be doubled if the price of rubber was 2*s*. 6*d*. per lb. or under and trebled if over that. This, it was proposed, was to be imposed in full with the exception of companies paying an income-tax so that the burden of the taxation would only fall on the locally registered companies and all not called upon to pay an income-tax.

Looking at the matter of an income-tax it would be seen that the Government proposed that this be imposed only on Europeans, and incomes over $500 per month were to be taxed at the rate of 25 per cent. The main question seemed to him, whether the Government should impose an income-tax as well as a rubber tax and whether the local companies were to be the sole exception.

Mr. JARVIS points out that an income-tax would hit the planting individual, who differed from the Government officer in that he did not receive a pension. The planter, who had to open up jungle and worked in districts damaging to his health, was called upon to pay the same amount as the Government man who lived in an healthy aspect. He put the point that the planter had no pension to look forward to and, in many cases, was dependent for his comfort in after life on the little that he could save.

Mr. H. R. QUARTLEY says that shareholders in rubber companies out here apparently were to bear a double taxation, which obviously was grossly unfair. He considers that in the event of the recommendation of the Taxation Committee of the Federated Malay States being adopted and an income-tax being imposed in the Federated Malay States, the same exemption should be made in the case of locally registered and private owners of rubber companies as is at present proposed in respect of the increased duty on rubber in regard to rubber companies paying income-tax at Home.

Mr. MOOIJAART puts forward the simple resolution that the Association did not favour an income-tax if the Draft Enactment published was imposed in full, as under it local companies were already taxed.

LIEUTENANT-COLONEL FOX seconds, and points out that money and shares coming out from Home were already taxed 5*s*. in £1. If they were going to knock off another 75 cents income-tax when

they came out here it was unfair and quite unjust. There was also the fact that the largest and wealthiest community—the Chinese—were not to pay the income-tax.

Mr. G. H. Bennett maintains that whether the other tax was imposed or not, they ought to object to only one section of the community being taxed. (Applause). He, therefore, would move that the Association is opposed to only one section of the community being taxed.

Mr. Munro seconds.

Mr. F. Clyde Jeavons believes that there were two lines on which they could act, but it should be one or the other. At present they were discussing both income-tax and the rubber tax. He was in favour of what Mr. Mooijaart had said; that was that they should throw out the income-tax and favour a restricted super tax.

With the concurrence of the respective seconders of the two previous motions, Mr. Mooijaart then moves and Mr. Bennett seconds that the Association, while not disfavouring sections 3 to 7 of the Draft Enactment on War Taxation, opposes an income-tax, should the Enactment in question be brought into force. In any case the Association protests against a tax, imposed on only one section of the community.

The resolution is put to the meeting and carried unanimously.

12.—ALIENATION OF LAND TO ALIENS.

Mr. Duncan observes that the next item had been placed on the agenda in consequence of two proposals (one from Lower Perak and the other from Central Perak) which had been held over from the last meeting. As regards the subject, most people had their own ideas on it, but he thinks that there were really three points from which it could be viewed.

First of all, as planters and as Britishers, they all objected to a lot of aliens, be they Americans, Danes or what not, coming into this country, especially at a time when British money and superintendence were engaged on other work. The argument which had been put forward that such capital would have the effect of lowering the price of rubber and profits he did not think was sound, but it was an inopportune time for Government to give out land which at an ordinary time would be opened up by the British. (Cheers.)

Then there was the point of view of the Local Government which would be unbusinesslike to refuse capital of any sort directed to the opening up of land, as every acre planted was a permanent asset to the country.

Thirdly, there was the view of the Imperial Government, but he doubted whether he or any other member was qualified to express an

opinion on that point. But they did know that allowing aliens to monopolize business in the past had led to difficulties which were undesirable. (Cheers.)

Mr. L. A. Irving points out that at a previous meeting his Association had brought up a resolution that no land be allotted to aliens during the war, an act which the Hon'ble Mr. Macfadyen had characterized as bold and more suited for the Paris Conference than a Planting Association. As a matter of fact, this was just the sort of expression of opinion which his Association had wished to elicit, by sending up their resolution.

Mr. Ferguson speaks on the desirability of the Planters' Association of Malaya expressing its views on the matter. It had been stated that if the Americans were not allowed to come to Malaya they would go to Sumatra. He was, however, led to believe that the land available in Sumatra was not very large. The only land which was available, he understood, was in Acheen, which was in a very unsettled state at present. Also, in Sumatra, there was a tax of 10 per cent. on profits, while here there was at the outside this $7\frac{1}{2}$ per cent. export duty, so terms here were more favourable to Americans. Another point was that the admission of capital from America did not prevent a large proportion of it being German capital, which was most undesirable when British capital was handicapped as it was at present. He had heard a rumour that land had already been granted but did not know whether it was true. If it was it was not consistent with the statement made by the Chief Secretary in the Federal Council.

Mr. Park observes that 25,000 acres had actually been granted in his district to an American concern.

Mr. Mooijaart submits that there could be no pronouncement of opinion at a general meeting like the present. On Mr. Ferguson's own showing there were all sorts of questions, such as what land was available, taxation, etc., which would have to be considered. He would deprecate any pronouncement of opinion at the present stage, but if they considered that the subject needed attention, a Committee ought to report on the matter first and it would surely be most regrettable if any resolution were passed precipitately, before the subject had been properly considered.

Mr. Jarvis would again raise the question of labour difficulties if Americans were allowed to take up large tracts of land, to develop them at express speed and asks if Government would pass an Enactment necessitating their importing their labour. (Cheers.)

Mr. Duncan believes that a clause would probably be inserted in the grant specifying an obligation on the part of the lessee to import his labour.

Lieutenant-Colonel Fox feels, after all they had heard, that there was no good purpose served by a waiting policy on their part.

An expression of opinion was expected from the Planters' Association of Malaya and it should be given now, and unmistakeably. (Applause.) He could not think, what it had got to do with them, what terms other countries were offering the Americans. Their opinion was that they should sooner see British capital than American. (Hear, hear.)

He would, therefore, propose that this Association deprecates the alienation of land to aliens at a time when British capital and superintendence is unavailable for opening up such land.

Mr. BENNETT seconds.

The motion is agreed to with three dissentients, and the Secretary is instructed to forward a copy of the resolution to the Chief Secretary.

13.—ESTATE HOSPITALS.

Mr. DUNCAN informs the meeting that he had received a letter from the Chief Secretary and proceeds to read the following correspondence:

"KUALA LUMPUR,
"*10th November, 1916.*

"No. 4528/16.

"Sir,

"I have the honour to inform you that I have received a letter from the Secretary to Government of Madras on the subject of the medical relief provided for Indian labourers on estates in the Federated Malay States. The Government of Madras had previously asked for information as to the number of hospitals actually existing and as to how many were in charge of resident medical practitioners and also for information as to the qualifications insisted upon in the case of those practitioners employed as resident medical officers in charge of hospitals who do not possess registrable qualifications. The information asked for was supplied and the letter which I have now received comments on this information.

"2. The Government of Madras observes that only eight hospitals (with 696 beds) are in charge of resident medical practitioners having qualifications registrable under the Medical Acts in force in Great Britain, while 163 hospitals (with 6,488 beds) are merely visited by qualified medical practitioners whose visits in more than half the cases do not occur oftener than once a week. They observe that under section 202 of the Federated Malay States Labour Code the Controller may require an employer of labour to employ a registered medical practitioner as defined by 'The Medical Registration Enactment, 1907,' to reside at and have charge of the hospital maintained by such employer, while section 206 of the Code gives the option of providing periodical visits only, by registered medical practitioners, of hospitals which are not in charge of such qualified men.

"3. The Government of Madras recognize that it may be difficult, perhaps impossible, to require that every estate hospital shall be in charge of a medical practitioner with qualifications as defined in the Medical Registration Acts in force in Great Britain, but the Government of Madras considers that there would not be the same difficulty about requiring that every such resident medical officer shall possess the qualifications which permit registration under the Madras Medical Registration Act of 1914. The act permits the registration of any person possessing either the M.B., B.S., degree of an Indian University or a diploma or certificate of a recognized Medical School in India or Ceylon. I understand that the Government of Madras does not mean to imply that only persons actually possessing these particular qualifications should be accepted as resident medical officers, but that qualifications of an equivalent kind should be required.

"4. His Excellency the Governor of Madras in Council evidently considers that these qualifications represent the minimum which should be accepted in any person entrusted with the charge of a hospital and that the practice of leaving the charge of the sick to persons who possess no qualifications whatever, as is believed to occur in some of the hospitals in the Federated Malay States, seems to His Excellency in Council to be indefensible, especially in view of the heavy mortality occurring among Indian labourers in some parts of the country.

"5. The Government of Madras, therefore, urges that a definite rule should be laid down insisting on the possession of the above-mentioned qualifications by all medical officers in charge of estate hospitals or other hospitals in which Indians are treated and fixing a reasonable time, not exceeding two years, within which the rule must be complied with.

"6. The Government of Madras also observe that it would conduce to the well-being of the female estate population if qualified midwives were employed in estate hospitals and hopes that favourable consideration will be given to this suggestion.

"Before replying to the Government of Madras I shall be glad to have the views of the Committee of the Planters' Association on these proposals.

"I shall be glad to have an early reply.

"I have, etc.,

"(Sd.) E. L. BROCKMAN,

"*Chief Secretary, F.M.S.*

"THE CHAIRMAN,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

"KUALA LUMPUR,
"*16th November, 1916.*

"SIR,

"I am instructed by the Chairman to acknowledge receipt of your letter 4528 of the 10th instant to him and to thank you for having referred the matter in question to the Committee of this Association for their opinion.

"This is now being formulated and will be forwarded to you as soon as possible.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"THE HON'BLE
"THE CHIEF SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

Continuing, Mr. DUNCAN reports that the question raised had been considered by the Standing Committee, who had also consulted expert opinion, and had now formulated a reply, which he proposed to send to the Chief Secretary, if they thought that it fairly represented their views.

The SECRETARY then reads the draft reply, as follows:

"*27th December, 1916.*

"SIR,

"I have the honour to revert to your letter 4528 of the 10th November, which has already been formally acknowledged by our Secretary, and I thank you for referring the matter in question to this Association.

"1. May I first of all repudiate the statement made by the Government of Madras who describe the mortality amongst Indian estate labourers in the Federated Malay States as 'heavy.' The mortality rates of estates in the Federated Malay States now rarely rise above 30 per mille and the average for the whole estate population during 1915 was 21 per mille, whilst the death-rate on a great number of estates calculated on the labour force only (and not on that of the total estate population) has been between 10 and 15 per mille. May I point out that in 1915 the death-rate for London was 16.1, for England and Wales 15.1, for Scotland 17.06, for the Madras Presidency 24, and for the Federated Malay States generally 28.92. From the above it will be evident that the views of the Madras Government appear to be based on a wrong premiss.

"2. As regards the lack of qualifications on the part of persons in charge of estate hospitals, it is true that few of them have any 'registrable' qualifications. But it is quite wrong in our opinion to

deduce from this fact the idea that these men are not qualified to carry out the duties assigned to them. Practically all of them have had some training in dispensing and in the rudiments of drug action to which must be added years of experience of general hospital work. It must be remembered that in estate hospitals the number of diseases are few, being practically restricted to malaria, bowel complaints and parasitical diseases. In fact, doctors qualified to judge have found these dressers superior to the raw youth straight from an Indian University, full of theory and altogether lacking in practical experience. The point in question has, moreover, lost value through the fact that since your letter was received new rules have been published under the Labour Code (*v. Gazette* of 12th December. 1916), making it obligatory for dressers to have some sort of a certificate of efficiency—a measure which this Association fully endorses.

"3. It is obvious that the dressers in question, however capable they may be in their own sphere of work should not be left entirely to their own devices. None of them at present are, and we quite agree that they should in all cases be, under a fully qualified medical man. At the present time, where group hospitals have no resident doctor, hospitals in charge of dressers are visited by European doctors and it is, of course, open to argument whether these visits are in all cases sufficiently frequent.

"The Government of Madras objects apparently to hospitals being 'merely' visited by qualified medical practitioners. In the experience of this Association the present system, combining practically efficient resident dressers with fully qualified visiting doctors, ensures the best results. And it will perhaps interest the Government of Madras to hear that the equivalent of the system on our estates is now being evolved in the rural districts throughout England and Scotland—*i.e.*, a system of small, so-called 'cottage hospitals,' which are in charge, not of resident doctors, but of trained nurses, the patients being seen by visiting medical practitioners.

"In many healthy districts here, one visit a week is ample, though in others, of course, this may be quite insufficient. It is well known that some of the hospitals are altogether empty for days and most of them contain only mild cases of malaria and of ulcers. Provision is already made in most cases (by the help of telephones and motor cars) for ensuring the attendance of the visiting doctor within an hour and less in cases of emergency—and if any improvement is necessary at all, this appears to us to be the line on which it should be made: but certainly not by the substitution of Indian assistant surgeons for fully qualified European doctors.

"4. This suggestion of employing resident assistant surgeons with Indian qualifications has been tried in this country and has

been proved to be altogether unsuitable. If estate hospitals employ men of this class, they are not likely and cannot be asked to employ the services of an European doctor as well, in which case the final superintendence of the hospitals will get into the hands not of better, but of less qualified men. If, on the other hand, an Indian is a good doctor he would not be content to stay at a small hospital where he would waste his time for lack of experience, unless he was allowed to do outside work, in which case he would of course be again in the same position as the present European visiting doctor. Again, if a highly qualified assistant surgeon was substituted for a dresser, whose chief duty is nursing, it is a foregone conclusion that little interest would be bestowed on the actual nursing of the sick — to the great detriment of the patients, for whose welfare the Madras Government is solicitous.

"5. Finally, I beg to point out that proper treatment in hospitals is not a panacea for reducing the mortality amongst the population and it may confidently be asserted that even visits twice a day to every patient in estate hospitals by European doctors of the highest qualifications would not materially reduce the general death-rate. Hospitals only attempt to cure but not to prevent diseases and before condemning the existing medical system on estates in this Peninsula it would have been well for the Madras Government to consider, not its doctrinaire merits, but the actual results it has achieved. The rubber industry, as is well known, has opened up hundreds of square miles of tropical jungle in this country and produced conditions which in the past history of tropical colonization have uniformly resulted in decimating outbreaks of disease. Yet confronted with such problems, our estates have succeeded not merely in keeping the death-rate stationery, but in actually reducing it in five years from 65 per mille to 21 per mille.

"All the three principal diseases in this country can be prevented and, therefore, ought to be prevented, notably malaria. But such prevention will not be brought about by increasing the hospital staff on estates, but only by the Government itself tackling the problem in a far-sighted and energetic manner, with a view of eliminating infection, not only for the benefit of estate labourers but of the whole population of the Federated Malay States, both rural and urban.

"I have, etc.,

"(Sd.) Wm. DUNCAN,

"*Chairman.*

"THE HON'BLE

"THE CHIEF SECRETARY,

"FEDERATED MALAY STATES,

"KUALA LUMPUR."

(Applause.)

The SECRETARY also draws attention to the new Rules which had come into force on the 12th instant. The main changes were that dressers now had got to have certificates of qualifications, that housing accommodation on estates was to be increased and, very significantly, that hospital accommodation had been reduced from 4 per cent. of the total labour force to $1\frac{1}{2}$ per cent. (Hear, hear).

Mr. DUNCAN enquires whether the draft met with their approval, in which case he would write to the Chief Secretary accordingly.

Agreed to.

14.—CURRENCY.

The SECRETARY reads the following letter:

"SINGAPORE,
"*18th December, 1916.*

"No. 5757/15.

"SIR,

"In continuation of my letter of the 5th June, 1916, I am directed to inform you that $15,000 worth of half-cent pieces are now ready for issue, and $10,000 worth of quarter-cent pieces are expected shortly.

"2. I am to enquire whether you are prepared to take over, on payment, the $15,000 worth of half-cent coins.

"I have, etc.,

"(Sd.) R. CRICHTON,
"*for Colonial Secretary,*
"*Straits Settlements.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. CLYDE JEAVONS reminds the meeting that this matter had been raised by the Kuala Lumpur District Planters' Association and been endorsed by the Planters' Association of Malaya. Now that the Government had complied with their request, it was clearly up to them to do their share in putting these coins into circulation.

Mr. DUNCAN agrees and suggests that all Constituent Associations be written to and asked how many coins they will put in circulation, also, after the total quantity has been ascertained, that the Secretary make the necessary arrangements with the Banks for stocking these coins.

Agreed to.

15.—SOCIETIES' ENACTMENT.

The SECRETARY reports that there seemed to be a necessity for the Association to be registered, not merely in Selangor, but in the whole Federated Malay States, and that he had accordingly made the requisite application and that exemption from registration in Perak, Negri Sembilan and Pahang had consequently been gazetted on 24th November.

16.—LABOUR COMMISSION.

Mr. DUNCAN wishes to refer to the impending visit of two gentlemen from India to enquire into matters in connection with the conditions of Indian labour out here—*viz.*, Mr. N. E. Marjoribanks, I.C.S., and the Hon'ble Khan Bahadur A. K. G. Ahmed Tamby Maricar. It would appear that they were not coming to criticise so much as to enquire into conditions so as to be able to make a report, the idea being that the system here might be good enough to apply to other countries. They would all agree that the planters were all glad to see them and the Association as well as individuals would give them every support and all facilities for seeing everything they wished to see. (Applause.)

17.—MAN-POWER IN MALAYA.

Mr. DUNCAN would like to touch on one more subject before he closed the meeting—*viz.*, in regard to the speech of the General Officer Commanding the Troops to the men he inspected in the Federated Malay States and the Colony. He had met some men who appeared to interpret what the General said in a different way than he did. He should like to give an interpretation of these remarks. First of all he did not take it that the General made a spontaneous appeal to people to give up their positions here but only expressed the Government's view of the subject. The General said that the statement he made was made with the authority and after the consideration of the Government. He said, in effect, that there were three considerations that should weigh with them about men going Home. First, regarding the military requirements of the country, he was prepared to say that we could do with less men. Then, in regard to the carrying on of our trade and industry, he was not prepared to say anything but considered that the best way to decide that was by Government appointing Advisory Boards, and he added that Government did not consider it desirable that men having wives and families to support should give up these responsibilities, the general impression being, of course, that the military situation was not so acute as many thought.

He also expressed the opinion that the class of men from here were well fitted to be officers—which the army always required. He, therefore, thought that if men could be spared under these conditions they should go.

If the Advisory Committees were appointed, the rubber industry therefore would, no doubt, be well represented. If they felt they could spare men it was imperative that they should do so. It might be that some employers might think that they could let men go, while others equally well stocked might think that they could not do so. This is where the Advisory Committee's usefulness would come in. Planters most decidedly should let men go, if they could go without endangering the industry, especially men who would be useful as officers. (Applause.)

The meeting terminates at 1 p.m.

H. C. E. Zacharias,
Secretary.

Exports of Rubber from British Malaya (other than F.M.S.).

State.	Month.	Quantity.	
		lbs.	ozs.
Johore	...	4,852,964	00
Kelantan	November	215,483	08
Kedah	October	699,998	11
Perlis	November	3,514	11
British N. Borneo ...	,, ...	544,973	00
Brunei	,, ...	14,972	00

Abstract of Meteorological Readings in the various Districts of Malaya for the month of November, 1916.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bharu	...	142.0	78.6	86.50	72.26	14.24	75.1	.804	72.7	82%	...	43.19	8.52
Pahang, Kuala Lipis	...	...	79.7	86.5	71.6	14.9	74.8	...	...	...	...	7.45	1.97
Johore, Johore Bharu	...	...	...	87.92	72.82	15.10	...	...	...	...	...	12.59	...
Singapore, Kandang Kerbau ...	29.775	162.	82.0	80.5	73.6	13.1	77.0	.863	...	79.	...	14.97	2.76
Malacca, Durian Daun ...	29.797	137.	81.6	86.3	71.7	14.6	78.3	.925	...	86.	...	7.15	2.26
Negri Sembilan, Seremban ...	...	148.5	79.7	90.5	72.3	18.2	74.1	.787	71.9	79.6	N.W.	5.89	2.03
,, Kuala Pilah ...	...	140.5	79.7	90.2	72.8	17.3	77.8	.885	75.4	82.2	...	6.99	1.40
,, Port Dickson...	...	103.0	80.8	86.5	73.9	12.6	76.9	.849	74.2	80.8	...	6.23	1.27
Selangor, Kuala Lumpur ...	29.780	138.1	80.3	88.4	72.7	15.7	76.3	.833	73.6	80.	N.E.	5.75	1.27
,, Klang	...	...	79.5	83.9	72.9	11.0	76.3	...	...	...	...	4.95	1.05
,, Kuala Selangor ...	...	...	...	87.3	74.2	13.1	...	...	...	...	...	4.70	1.50
,, Rawang	...	...	...	91.5	...	...	...	...	...	...	...	6.52	1.92
Perak, Telok Anson	...	...	80.89	91.	70.	21.	77.14	.883	...	85.	...	13.85	3.97
,, Ipoh	...	...	81.09	92.	70.	22.	76.26	.841	73.96	80.	...	10.35	3.11
,, Taiping	...	114.	79.99	92.	71.	21.	76.25	.856	...	85.	...	12.24	3.07
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	47.79	4.72
,, Parit Buntar	...	...	81.99	92.	72.	20.	77.41	.880	...	81.	...	6.14	1.77
Penang Georgetown	29.815	141.	82.3	88.3	73.3	15.	77.8	.874	75.3	81.	N.W.	4.97	1.76
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	5.14	.95
Perlis, Perlis	...	...	...	84.12	72.09	12.03	...	...	...	...	...	10.26	...